DOCUMENT RESUME

ED 192 024 CE 026 375

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TITLE Data Processing Reading Strategies. 1980 Vocational Reading Series.
INSTITUTION Pennsylvania State Dept. of Education, Harrisburg. Bureau of Vocational and Technical Education.; Pennsylvania State Univ., University Park. Div. of Occupational and Vocational Studies.
SPONS AGENCY Office of Education (DHEW), Washington, D.C.
PUB DATE 80
NOTE 143p.: For related documents see CE 026 302-303 and CE 026 374-376.

EDRS PRICE MF01/PC06 Plus Postage.
DESCRIPTORS *Business Education: Case (Grammar): *Cloze Procedure: Computer Science Education: Content Area Reading: *Corrective Reading: *Data Processing: Directed Reading Activity: Job Skills: Learning Activities: Learning Disabilities: Postsecondary Education: *Readability: Readability Formulas: Reading Comprehension: *Reading Difficulties: Reading Skills: Secondary Education: Teaching Methods: Vocational Education
IDENTIFIERS SQ4R Method

ABSTRACT

Data Processing Reading Strategies is one of five instructional guides in the Reading Strategies in Vocational Education Series. Developed to assist teachers working with students considered disadvantaged because of reading deficiency, the guide contains several strategies, suitable for adaptation, specifically related to data processing instruction. Each of six sections into which the guide is divided contains informational material and extensive examples and exercises. Section 1 concerns readability and gives procedures and guidelines for collecting samples and how many to collect. Section 2 briefly describes the Cloze procedure and its usefulness as a reading test and as a teaching technique for the theory of case grammar. The following four sections each present a set of important reading skills: Basic Vocabulary Skills, Paragraph Comprehension, SQ4R (Survey, Question, Read, Record, Recite, Review), and Recognizing and Recording Complex Information. Each skill is broken down into segments requiring no more than 5-10 minutes of class time every other day. Homework utilizes text assignments normally required. Following individual skill discussions is the part, Textbook Application, where each skill is applied to the course's own textbook. Each section ends with additional suggestions for teaching the new skills. (A time frame is provided for teaching the skills.) (YLB)

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DATA PROCESSING READING STRATEGIES

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FORWARD

Education amendments in 1976 (P.L. 94-482) provide for special assistance to a wide variety of students with "special needs." The special needs of these sutdents are derived from conditions of the students which are believed to inhibit success in vocational programs. Both handicapped and disadvantaged individuals are to be served by the legislative provisions.

Academically disadvantaged students are those individuals who, because of math, reading, or communication deficiences, may not be able to succeed in vocational programs. Legislation has provided for research and development projects to address the needs of these individuals. The projects in progress have been designed to respond to that call for research and development.

This instructional guide was developed for the purpose of assisting Data Processing teachers in their work with students who are considered disadvantaged because of reading deficiency. It was developed as a result of vocational reading research at The Pennsylvania State University. The guide is intended to be presented at workshops in 1980 funded by the Pennsylvania Department of Education.

"Data Processing Reading Strategies" have been developed according to certain distinct characteristics of reading requirements in vocational education:

(1) Reading is a vocational skill, one that requires reading abilities that differ from those associated with general literacy.

(2) There is a difference between curricular literature (textbooks and other literature which must be read in the context of student status) and occupational literature (manufacturers instructions, codes, specifications, safety warnings, etc.).

(3) Occupational reading skills are appropriately addressed in the vocational curriculum.

(4) There are strategies available to vocational teachers which need little or no reading specialization.

(5) Available strategies reflect the unique qualities of vocational reading, address general vocational reading skill requirements, and are useful for helping students disadvantaged because of reading deficiencies.

This guide is NOT intended to be envisioned as the final word in reading strategies. It contains examples of several strategies believed to be useful for the vocational instructor seeking methods that are specifically related to data processing education. The instructors are responsible for taking these examples and applying them to their occupational specialties. Not all of the methods will work for all data processing teachers or their

respective students. The methods were designed to be adapted, not rigidly adhered to.

Companion R & D projects at Penn State will provide useful complementary aids. An Employability Skills Curriculum Guide (Wircenski, McPherson, Feng, 1980) will soon be available. That guide addresses socialization, financial management, values clarification, job procurement, and communication skills. Four other occupational specialties (Carpentry, Cosmetology, Medical Assisting, and Radio and Television) will be the bases for reading strategy guides (Thornton, 1980). These guides will focus more specifically on other occupational areas utilizing a format similar to the Data Processing guide.

Field testing during 1980-81 school year is expected to result in additional refinements of the several reading strategies. Criticism and recommendations are invited by all who receive these materials. Correspondence should be addressed to

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1980

ACKNOWLEDGEMENTS

The Reading Strategies in Vocational Education Series, of which this book is one part, has resulted from research conducted by the Division of Occupational and Vocational Studies, The Pennsylvania State University and the Bureau of Vocational Education, Pennsylvania Department of Education. Many people, not expressly identified as part of the project, have served willingly in the dispatch of its objectives. Appreciation is especially expressed to Mr. Wayne Grubb, Consultant for Disadvantaged and Handicapped, Bureau of Vocational Education, Pennsylvania Department of Education, for his support and procedural advice.

Fifteen Area Vocational-Technical Schools in the Center Region of Pennsylvania participated in the development of the series. Scores of manufacturers, publishers, and employers provided literature and information. A listing of the schools, manufacturers, publishers, and employers follows. The project would have been impossible without their help.

Two research efforts provided considerable information toward the development of the series. The first, Basic Reading Skills and Vocational Education, was published by The National Center for Research In Vocational Education under the auspices of the Knowledge Transformation Project. That publication was supervised by Dr. Carol P. Kowle. The second, Review and Synthesis

of Reading In Vocational Education, was published by the Division of Occupational and Vocational Studies in conjunction with the Division of Education Administration Policy Studies and The Pennsylvania Department of Education. Both titles are available directly from their respective publishers.

Appreciation is expressed to Mrs. Laura Frye for her careful attention to the typing and proofreading of not only the final drafts of each title in the series, but all the preliminary work and intervening drafts required.

DISCLAIMER

The activity which is the subject of this report was supported in whole or in part by the U. S. Office of Education, Department of Health, Education, and Welfare. However, the opinions expressed herein do not necessarily reflect the position or policy of the U. S. Office of Education, and no official endorsement by the U. S. Office of Education should be inferred.

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SECTION 1
READABILITY

In order to plan for intervening in situations of reading deficiency, several pieces of information are required. First, it must be known how urgent the ability to read really is, in the context of both curriculum and occupational requirements. This does not suggest that reading, in the general literacy sense, may not be important. Educators clearly recognize that reading ability is crucial if learning is to occur. What this first question addresses is an examination of objectives and their component tasks to ascertain how much reading is required to complete the tasks and, ultimately, the objectives of the course.

Although there has been no research to date to distinguish between curricular and occupational reading requirements (Reference Note[1]) it is not difficult to visualize differences between textbook reading and, for example, manufacturers maintenance manuals. When Arnold, Hill, and Nichols in Modern Data Processing (1978) advised the console operator to generally follow the procedures as set out in the operating instructions sheet, it was intended that the student of data processing read this literature. That directive identifies two kinds of reading: that which is required to read the textbook (curricular) and that required to read the manufacturer's instructions (occupational). Previous research (De. W. Smith, 1974; Thornton, 1977; Thornton, 1980) suggests that there could be significant differences in the readability level of sections of textbooks dealing with specific tasks and the readability level of literature pertaining to the performance of those tasks.

It is a fact that reading literature peculiar to an occupational specialty at least implies that some form of reading is a vocational skill. Thus, the second bit of information must be collected. It must be known (or decided) if the teacher, the school, and the school district intend to address reading within the vocational curriculum or as prerequisite skill. If reading is to be dealt with in the vocational curriculum, then all students must receive some form of vocational reading instruction. If, however, reading skill is envisioned to be prerequisite then the thrust of reading in vocational settings would be toward dealing with deficiencies. The strategies, in the latter situation, would be individualized and delivered on a case by case basis.

The previous two pieces of procedural information are fairly general; the third and fourth are specific. The third deals with how difficult literature in a specific occupational curriculum is to read. What is the readability level? The fourth deals with how able students are in terms of reading ability. Can students read literature necessary to succeed in a vocational program? We shall deal with these issues separately.

Readability Procedures

Readability procedures are devices to estimate the grade reading level (GRL) of selected pieces of literature. In other words, a readability analysis determines the approximate GRL a person must possess in order to read the literature analyzed. Note the underlining of estimate and approximate. It must be cautioned

that, although these procedures have been validated by extensive research, they are not the sole determinants of readability. Muncrief (1975) discussed a variety of other considerations that are involved in readability assessments. For our purposes of matching literature assessment to student ability an index of readability is a useful measure.

There is a second caution needed about readability procedures. Preliminary results of current research (Reference Note[2]) brings up serious questions about trying to find an average readability level of occupational literature. For example, what does it mean that the average (the word "mean" is normally substituted for the word "average") readability level of a textbook is ninth (9th) grade? Because the word average or mean is used, it can be assumed that some of the literature is higher than ninth and some of it lower. What the average does not tell us is the range of readability levels and the concentration (mode at any level) of readability level.

In order to make sense out of that argument, a little must be known of how readability assessments are done. When analyzing a textbook (or any other lengthy piece of literature) random samples are selected. These samples are analyzed and an average of all of their readability levels is calculated. That average is the mean readability level of the literature. We will get more explicit about how this is done in the next section.

To point out the problem with using the mean (average) some hypothetical samples have been graphed below. The graphs show the

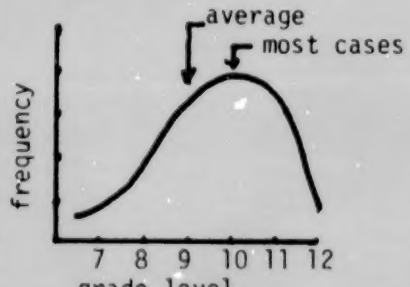
curve which would result if the frequencies of grade level of samples were plotted on the graph. The vertical axis of the graphs represents the frequency that samples were found to be at a particular grade level. The horizontal axis represents the specific grade levels. (See Figure 1)

All of the preceding graphs are of books at the ninth grade readability level. But they all differ in the concentration (mode) of levels. The point here is simply that the mean or average can be a deceptive statistic. The analysis can still be useful, providing the results include the range and distribution of readability scores sampled.

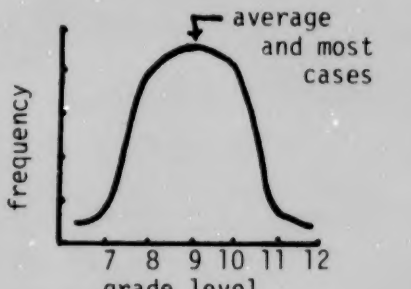
Two readability procedures will be discussed: (1) Fry procedure (See Figure 2); and (2) Flesh procedure (See Figure 3).

A form for calculating has been included to simplify the Flesh Formula calculations. (See Figure 4)

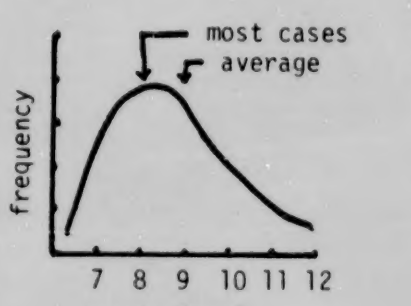
Figure 1: Sample Readability Graph



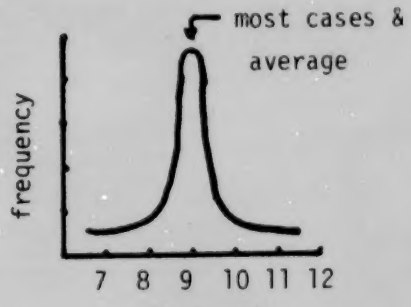
(most cases above 9th)



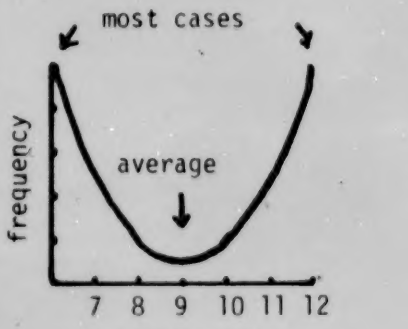
(most cases at 9th substantial variability)



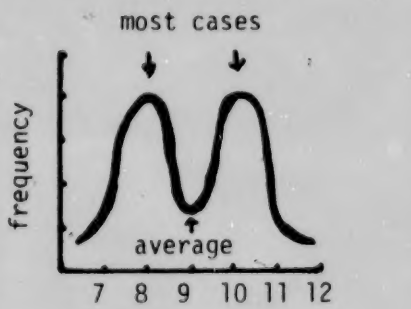
(most cases below 9th)



(most cases at 9th slight variability)



(most cases at highest and lowest levels)



(most cases one grade higher and lower than average)

Figure 2: GRAPH FOR ESTIMATING READABILITY
by Edward Fry, Rutgers University Reading Center, New Jersey
Average number of syllables per 100 words

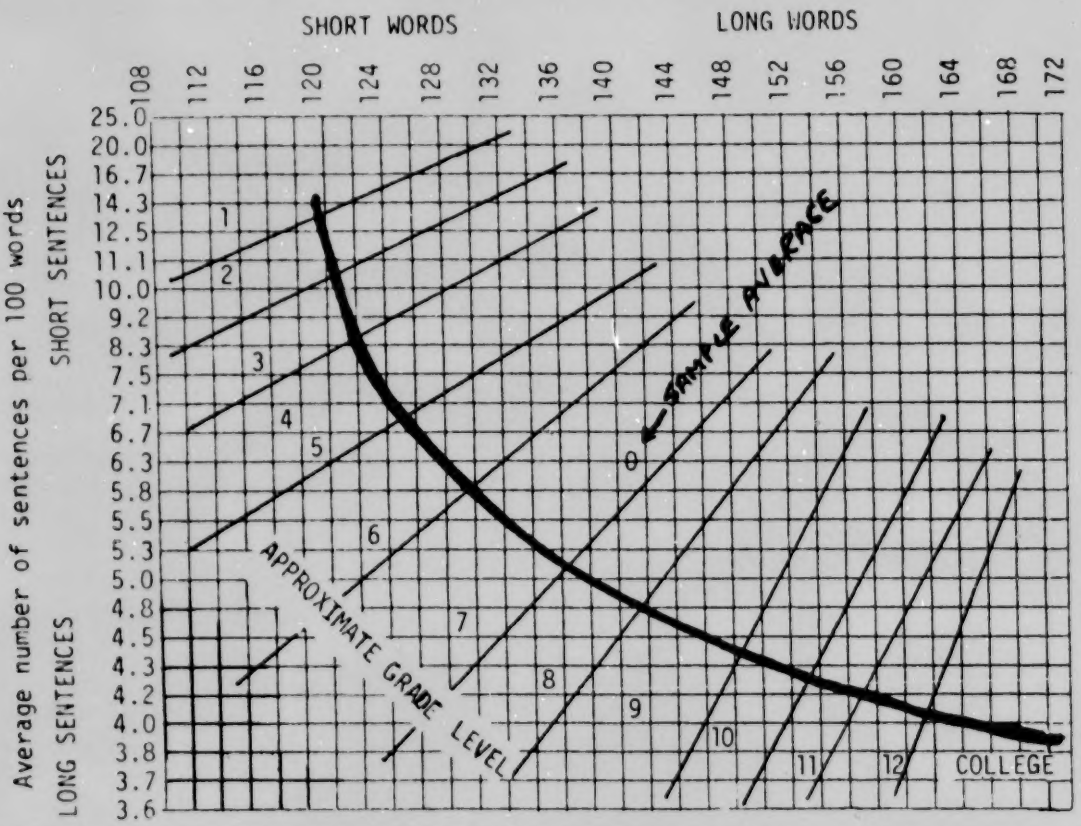


Figure 2 (Continued)

Directions: Use a stratified random procedure, at least five percent for books, more for shorter materials. For example: If a book is 350 pages long, five percent equals 17.5. 350 ÷ 17.5 equals 20. Select a starting number, for example: 6. The first sample page is 6; then 26; then 46; then 66; etc. If one of the pages has no text proceed one page at a time forward until a page is found from which a sample can be taken.

From each of these pages select 100 word passages (alternate positions on page from which taken. For example: beginning, middle, ending). Plot the average number of syllables and average number of sentences per 100 words on the above graph.

This will give you the average readability of the book.

Example:

	Syllables	Sentences
First 100 Words	124	6.6
Second 100 Words	141	5.5
Third 100 Words	158	6.3
Average	141	6.3

Then plot the syllables and sentences for each sample. This will illustrate the range of readability for the literature being analyzed.

(For further information and validity data, see April, 1968 Journal of Reading and March, 1969 Reading Teacher.)

Figure 3: FLESH READABILITY FORMULA PROCEDURE

There is one readability procedure that is easily used with the assistance of a simple calculator. The Rudolph Flesh (1949) Readability Formula involves a count of the syllables in the sample and words per sentence in conjunction with a mathematical formula. The result is a "Reading Ease Score" which translates into grade reading level.

I. 1. Count the words in the sample (100 words or more, if available).
2. Count the number of sentences.
3. Divide the total number of words by the total number of sentences.
4. Multiply that total (average number of words in a sentence) by 1.015.

II. 1. Count the syllables in the sample.
2. Multiply the number of syllables by 100.
3. Divide that total by the number of words in the sample.
4. Multiply that total by .846.

III. Add I and II.

IV. Subtract III from 206.835.
That is the reading ease score. It translates accordingly:

R.E.Score	Grade	R.E.Score	Grade
115-120	1	80- 89	6
110-114	2	70- 79	7
105-109	3	60- 69	8.5
100-104	4	50- 59	11
90- 99	5	30- 49	14.5
		0- 29	College Grad.

Flesh, Rudolph. The Art of Readable Writing. New York: Harper and Brothers, 1949.

Figure 4: Flesh Readability Procedure Form

Textbook_____ Publisher_____

Pg.#	#Wds. ÷ #Sent	x 1.015 = X	#Syl x 100 ÷ #Wds.	x .846 = Y

Figure 4 (Continued)

	Minus (x + y)	R.E. Score
206.835		
206.835		
206.835		
206.835		
206.835		
206.835		
206.835		
206.835		
206.835		
206.835		
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206.835		
206.835		
206.835		
206.835		
206.835		

R.E. Score	Grade
115-120	1
110-114	2
105-109	3
100-104	4
90-99	5
80-89	6
70-79	7
60-69	8.5
50-59	11
30-49	14.5
0-29	College Grad.

The textbook sample in Figure 5 demonstrates the rules.

Instructions for Calculations

WORD COUNT - Fry: Count all words up to 100 words (may end in partial sentence. Flesh: Count all words up to approximately 100 (end on full sentence).

Numbers - such as 30, 1951, 27-A, L78G are all counted as one word.

Hyphenated words - one word.

Abbreviations - one word.

Acronyms - such as PVA, NSU, USA, AVA are each counted as one word.

SENTENCES - Fry: Count the sentences and determine the tenth of a sentence when ending in a partial sentence. Flesh: Count all sentences.

Parenthetical expression - (enclosed in brackets) is one sentence even if contained in another sentence.

Semi-colon or colon - If there is a semi-colon or colon in what we usually consider a sentence, that is considered to be another sentence. The easiest way to handle that is to count one sentence overall and add one sentence - count for each colon or semi-colon in the sentence.

RECORDING - Fry: Write down the number of sentences per 100 words. In the example the 100th word is "requires." There are 5 full sentences, plus the partial sentence ending in "requires." There are 7 words up to and including "requires" and 21 words in the sentence. Divide 7 by 21 (7 ÷ 21). That result is approximately

FIGURE 5: SAMPLE WITH WORD COUNT OVER WORDS

```
   1     2       3 4    5          6      7
    A SUBROUTINE IS A STANDARD SEQUENCE OF

      8          9      10   11     12     13
INSTRUCTIONS DESIGNED TO DIRECT THE COMPUTER TO

  15  16 17     18          19           20
CARRY OUT A SPECIFIED OPERATION.  ORIGINALLY,

  21   22      23        24     25 26   27      28
THESE BASIC ROUTINES RECORDED IN A COMPUTER INPUT

  29     30      31     32  33   34      35     36  37
MEDIUM WERE INCLUDED IN THE SOURCE PROGRAM AT THE

  38     39     40     41        42   43   44  45  46
PROPER PLACE AND ASSEMBLED ALONG WITH THE REST OF

 47   48       49  50    51      52      53        54
THE PROGRAM.  IN OTHER WORDS, THE SUBROUTINES HAD

55 56     57     58  59   60     61    62    63     64
TO BE INSERTED AT EACH POINT THAT THEY WERE NEEDED

65 66  67     68  69    70   71     72     73 74  75
IN A ROUTINE AS SHOWN IN FIGURE 13-1.  AS A RESULT

 76   77      78     79  80  81       82          83
THEY WERE INCLUDED IN THE MAIN OPERATIONAL SEQUENCE

84  85   86      87         88   89   90  91  92
OF THE OBJECT PROGRAM.  THESE ARE KNOWN AS OPEN

    93
SUBROUTINES.

    94   95       96       97  98  99     100
     A CLOSED SUBROUTINE IS ONE THAT REQUIRES

   101        102  103  104 105 106 107  108
PROGRAMMING ONLY ONCE SINCE IT MAY BE ENTERED
```

FIGURE 5 (CONTINUED)

```
109   110     111  112 113 114
FROM SEVERAL POINTS IN A PROGRAM.  AS A MEANS OF
AVOIDING REPETITION OF THE SAME SEQUENCE OF
INSTRUCTIONS IN DIFFERENT PLACES IN THE MAIN
ROUTINE, CONTROL MAY BE TRANSFERRED TO A CLOSED
SUBROUTINE FROM MORE THAN ONE PLACE IN THE MAIN
ROUTINE.
```

(ARNOLD, HILL, NICHOLS, 1978, PP. 253-4)

.33 and rounds to 0.3. Therefore, for the Fry sentence count there are 5.3 sentences per 100 words. Flesh: Count to the end of the sentence in which the 100th word occurs. Therefore, there are 114 words and six sentences. Enter these figures on the form and complete the math involved.

SYLLABLES - Syllables are counted in the same way for each procedure. An easy way is to count only those syllables over 1 for each word. For example:

```
          1    2              3        4           5     6
A sub/rou/tine is a stan/dard se/quence of in/struc/tions
      7            8           9  10        11
de/signed to di/rect the com/pu/ter to car/ry out a
     12 13     14 15  16
spec/i/fied op/er/a/tion.
```

Complete the counting for the entire passage in the same manner. Your total then is added to the total number of words (100 for Fry; 107 for Flesh, in this example). That gives you the total syllable count.

RECORDING - Fry: Write down the total number of syllables. On the graph plot the total syliables (across) to the number of sentences per 100 words. That will give you the approximate readability level of that passage. Flesh: Write down the number of syllables in the space on the form and complete the mark as noted. Then add x and y and subtract that figure from 206.835. That is the Reading Ease score and translates to grade level on the chart.

The total sample syllable count and results for Flesh and Fry methods follow in Figure 6.

FIGURE 6: SAMPLE TEXT WITH SYLLABLES MARKED

A SUB/ROU/TINE IS A STAND/DARD SE/QUENCE OF IN/STRUC/TIONS DE/SIGNED TO DI/RECT THE COM/PU/TER TO CAR/RY OUT A SPEC/I/FIED OP/ER/A/TION. O/RIG/IN/AL/LY, THESE BA/SIC ROU/TINES RE/CORD/ED IN A COM/PU/TER IN/PUT MED/I/UM WERE IN/CLUD/ED IN THE SOURCE PRO/GRAM AT THE PRO/PER PLACE AND AS/SEM/BLED A/LONG WITH THE REST OF THE PRO/GRAM. IN O/THER WORDS, THE SUB/ROU/TINES HAD TO BE IN/SERT/ED AT EACH POINT THAT THEY WERE NEED/ED IN A ROU/TINE AS SHOWN IN FIG/URE 1/3/-/1. AS A RE/SULT THEY WERE IN/CLUD/ED IN THE MAIN OP/ER/A/TION/AL SE/QUENCE OF THE OB/JECT PRO/GRAM. THESE ARE KNOWN AS OP/EN SUB/ROU/TINES.

A CLOSED SUB/ROU/TINE IS ONE THAT RE/QUIRES PRO/GRAM/MING ON/LY ONCE SINCE IT MAY BE EN/TERED FROM SE/VER/AL POINTS IN A PRO/GRAM.

Note that for numbers and acronyms, each letter (number) counts as a syllable.

The following results were obtained from readability analyses of the preceding sample.

Fry:

100 words

5.3 sentences

164 syllables

11th grade

Flesh:

114 words

6 sentences

185 syllables

R.E. Score 50.26

11th grade, but at highest end.

Exercise 1

Following are three examples selected from other sections of the same textbook. Practice the procedure, marking syllables and sentence count directly on the samples.

Exercise 1 Sample 1

On direct access devices, the sequential organization and other methods to be described later usually employ the cylinder concept of recording data. The cyclinder concept makes it possible to utilize direct access storage devices very efficiently. This is achieved by taking advantage of the fact that all access arms on a disk drive move in and out in unison. They are, therefore, all positioned at the same time over the relative track on each recording surface. This allows data to be read or written on the same track of each recording surface without interruption for head movement.

Each track represents a complete circle on the disk recording surface in which data is recorded serially bit by bit.

(Arnold, Hill, Nichols; 1978, p. 156)

Exercise 1 Sample 2

Broadband Exchange Service. Western Union's Broadband Exchange Service links two subscribers over transmission channels that they select as best suited to their communications needs. By means of a voice-data instrument containing ten push buttons, users can select the broadband width that will furnish optimum, economical data transmission (Figure 11-15). Type of transmission may include voice, facsimile, or digital data as contained in punched cards, punched tape, magnetic tape, and electronic storage devices. Thus, a firm desiring to have a problem solved could utilize the services of a computer at a remote location, possibly in a service center. Such services could be provided on a call-up basis through Broadband Exchange Service connections.

(Arnold, Hill, Nichols; 1978, p. 216)

Exercise 1 Sample 3

The majority of data entering business data processing systems must be converted to a computer language compatible with the equipment being used. The bulk of this transcribing from human-readable documents to computer language is performed by operators using data entry devices. Most documents are received by data processing in groups or stacks called batches. These batches should have associated with them a control or batch ticket that shows from whom the documents were received, the date, perhaps the time, and a document count (Figure 16-1).

Control totals of quantitative data may also be provided. A control total is the sum of the quantitative data recorded in a common field of each record in a batch of records.

(Arnold, Hill, Nichols; 1978, p. 308)

SAMPLES: HOW SELECTED AND HOW MANY

It is important, if an accurate picture of the literature is to be obtained, that the samples to be analyzed be selected at random. Too many subjective errors would be introduced by merely paging through the book, picking what appears to be representative samples. The easiest way and one that is sufficiently random is entitled a stratified random sampling.

In order to achieve the stratified random sample, it must first be decided how many samples are to be drawn. A useful rule is to select samples from 5% of the pages in the book. Remember, however, that the more samples drawn, the more accurate will be the analysis. That point is demonstrated in the following analyses (See Figure 7) of the textbook under consideration in which 3, 6, 10, 15 were drawn. (Average was used in this case to distinguish between results of analyses in which increasing numbers of samples were drawn.)

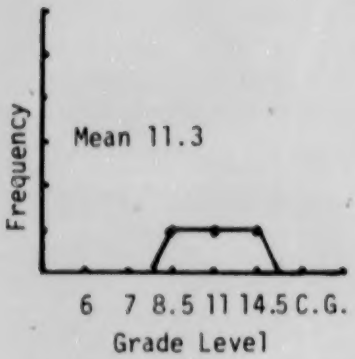
It is recommended that 5% sample or more be drawn for accuracy.

Procedure: Assume a book has 300 pages (not including glossary or index). A 5% sample requires (.05 x 300) 15 samples. To establish the starting page divide the total pages (300) by the total samples required (15). That result is 20. Randomly pick a number from 1-20. This can be done using numbers in a hat. That number is the starting page. Let's assume it is 6. The remainder of the pages are selected by adding 20 to 6, 20 to 26, 20 to 46, etc. until all the samples are drawn.

Figure 7: Sample Graphs of GRL
Frequencies: 3, 6, 10, 15 Samples

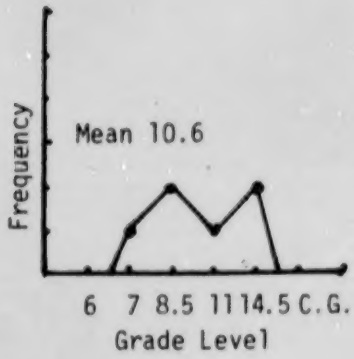
3 Samples

GRL	Freq.
8.5	1
11	1
14.5	1



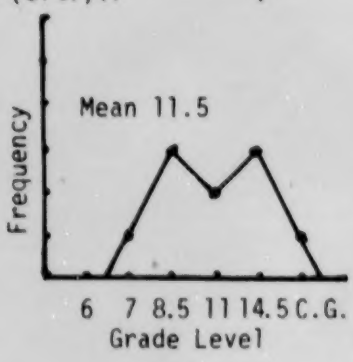
6 Samples

GRL	Freq.
7	1
8.5	2
11	1
14.5	2



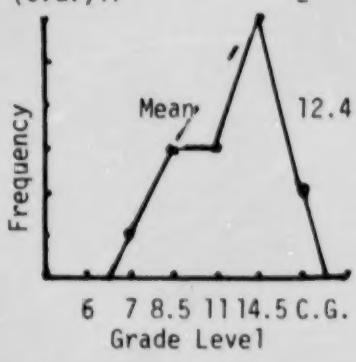
10 Samples

GRL	Freq.
7	1
8.5	3
11	2
14.5	3
(C.G.)17	1



15 Samples

GRL	Freq.
7	1
8.5	3
11	3
14.5	6
(C.G.)17	2



Now we know the pages of the book we will use in the analysis. If any of those pages contains no text (some may be pictures or diagrams) move one page at a time forward or backward until text is found. It is also recommended that the sample 100 words be selected alternatively from the beginning (B) and end (E) of the page. Therefore, page 6 would be 6-B (for beginning), page 26-E (for end), page 46-B, etc.

Exercise 2

Compute a stratified random sample schedule for the following:

1. Textbook with 350 pages.
2. Textbook with 1000 pages.
3. Textbook with 525 pages.

If the literature you plan to analyze contains less than 200 pages, but more than 25, select 10 samples. For literature of less than 25 pages, but more than 5, select every other page. For literature less than 5 pages, take a sample of every page.

On the following page (See Figure 8) is a form to assist you in recording your findings. It is always a good idea to keep a file of literature analyzed.

Figure 8: Readability Record

Author(s):

Title of Literature:

Publisher:

Publication Data:

Total Number of pages:

Percent of pages sampled:

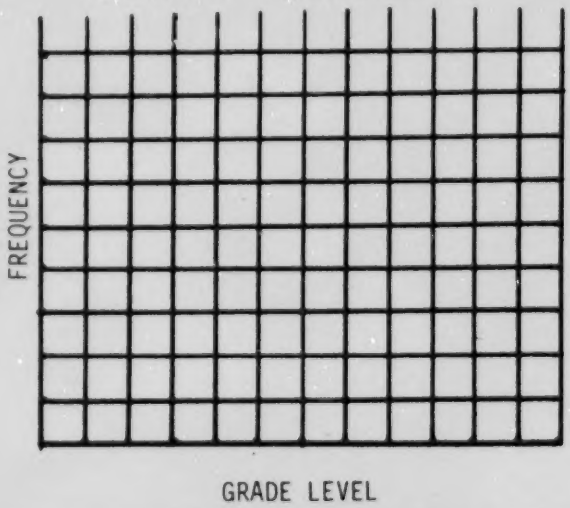
Procedure used:

Page numbers from which samples were taken:

Highest readability:

Lowest readability:

Graph for Plotting Results



SECTION 2
CLOZE PROCEDURE

STUDENT READING ABILITY

Diagnostic reading test scores are often available for students in vocational programs. These scores, normally on file at the home school (in the counselors office at the comprehensive high school), are useful indicators of a student's general reading ability. How well they relate to vocational reading requirements is subject to conjecture. There simply has not been a concerted effort to separate vocational reading skill from general literacy skill. Because of these unknowns it is strongly recommended that you not accept a GRL score as final. Standardized reading test scores are useful indicators, but they should be supplemented with teacher made vocational reading tests.

A useful and highly adaptable reading test is the cloze procedure

> The cloze procedure is an objective measure of language correspondence between reader and writer. It consists of a cloze (word) unit, a single occurrence of a successful attempt to reproduce accurately a part deleted from a message, by deciding from the context that remains what the missing part should be (Taylor, 1953).
>
> The cloze procedure differs from vocabulary contextual tests. Rather than choosing omitted words because of definition and purpose, the cloze units are chosen mechanically; every fifth word, for example, occurring at any point in a continuous passage is omitted. The cloze design incorporates control against misrepresenting strength/weakness in content vocabulary as an indication of the test subject's ability/inability to read (Thornton, 1979).

Any piece of literature can be clozed. That includes textbooks, occupational literature, safety messages, codes, medical contraindications, literally anything. The procedure is described below:

1. Select a piece of literature.
2. Leave the first sentence intact.
3. Delete every fifth word.
4. Leave the last sentence intact.
5. Instruct the student to read the entire passage first, then begin filling in the blanks.
6. Instruct the student to be aware when quessing is the rationale for word selection, but to guess when other rationale fails.

Scoring the test is accomplished as follows:

0-39.9% Frustrational level (Student will not be able to read the literature)

40.0-69.9% Instructional level (Student will require intervention to be able to read the literature)

70.2-100.0% Independent level (Student is able to read the literature without intervention)

On the following pages five different cloze tests have been prepared using on-the-job literature. The correct words which have been deleted are listed following each example. (See Figures 9-13)

FIGURE 9: MICROCOMPUTER PROCESSORS
CLOZE TEST
USING CONSOLE ODT COMMANDS

6.1 THE HALT MODE

CONSOLE ODT COMMANDS ARE EXECUTED BY THE LSI-11 PROCESSOR ONLY WHEN THE PROCESSOR IS IN THE HALT MODE. WHEN IN THIS MODE, _____ PROCESSOR RESPONDS TO COMMANDS _____ INFORMATION ENTERED VIA THE _____ TERMINAL, AND ALL PROCESSOR _____ IS CONTROLLED BY THE _____ MICROCODE.

NOTE

FOR CONSOLE _____ COMMUNICATION, THE SERIAL LINE _____ MUST BE CONFIGURED FOR _____ BUS ADDRESSES 177560 THROUGH _____. THESE ADDRESSES ARE INCLUDED _____ THE LSI-11 PROCESSOR MICROCODE _____ CANNOT BE CHANGED. IF _____ DEVICE RESPONDS TO THE _____ ADDRESSES, BUS TIMEOUT

FIGURE 9 (CONTINUED)

ERRORS _____ OCCUR AND THE PRO-
CESSOR _____ GO INTO AN INFINITE
_____ LOOP. THE ONLY WAY _____
GET OUT OF THIS _____ IS TO
INITIALIZE THE _____ (MOMENTARILY
ASSERT THE _____ H SIGNAL LOW, OR
_____ THE POWER OFF AND _____
ON).

THE HALT MODE _____ ENTERED IN ONE OF
_____ FOLLOWING WAYS.

- EXECUTING A _____ INSTRUCTION
- PRESSING THE BREAK _____ ON THE CONSOLE TERMINAL (_____ FEATURE CAN BE DISABLED _____ REMOVING A JUMPER ON _____ CONSOLE DEVICE SERIAL LINE _____)
- DURING POWER-UP (POWER UP _____ 1 CONFIGURED ON THE _____ MODULE)
- THE BHALT L _____ SIGNAL IS ASSERTED
- A _____ BUS ERROR (BUS ERROR _____ WITH SP (R6) POINTING _____ NONEXISTENT MEMORY)

FIGURE 9 (CONTINUED)

- A _____ ERROR (TIMEOUT) DURING MEMORY REFRESH
- A BUS ERROR (TIMEOUT) _____ THE PROCESSOR IS ATTEMPTING _____ INPUT A VECTOR FROM _____ INTERRUPTING DEVICE

UPON ENTERING _____ HALT MODE, THE PROCESSOR _____ THE FOLLOWING ASCII NONPRINTING _____ PRINTING CHARACTERS TO THE _____ TERMINAL.

<CR><LF>

NNNNNN<CR><LF>

@

THE NNNNNN IS _____ LOCATION OF THE NEXT _____ TO BE EXECUTED, AND _____ ALWAYS THE CONTENTS OF _____ PC (R7). THE <CR> _____ <LF> ARE CARRIAGE RETURN _____ LINE FEED CODES. THE @ SYMBOL IS DISPLAYED AS THE PROMPT CHARACTER FOR THE OPERATOR; ODT WILL

FIGURE 9 (CONTINUED)

```
ACCEPT ANY OF THE COMMANDS DESCRIBED IN THIS
CHAPTER AT THIS POINT.
```

MICROCOMPUTER PROCESSORS. MICROCOMPUTER HANDBOOK SERIES. MAYNARD, MASSACHUSETTS: DIGITAL EQUIPMENT CORPORATION, 1978.

FIGURE 9 (CONTINUED)

THE	LOOP	TRAP
AND	SYSTEM	TO
CONSOLE	BDCOK	BUS
RESPONSE	CYCLE	REFRESH
PROCESSOR	THEN	WHEN
ODT	IS	TO
UNIT	THE	AN
CONSOLE	HALT	THE
177566	KEY	OUTPUTS
IN	THIS	AND
AND	BY	CONSOLE
NO	THE	THE
ABOVE	UNIT)	INSTRUCTION
WILL	MODE	IS
WILL	PROCESSOR	THE
MICROCODE	BUS	AND
TO	DOUBLE	AND

MICROCOMPUTER PROCESSORS. MICROCOMPUTER HANDBOOK SERIES. MAYNARD, MASSACHUSETTS: DIGITAL EQUIPMENT CORPORATION, 1978.

FIGURE 10: OUTPUT-FORMAT SPECIFICATIONS FORM

CLOZE TEST

ADDING RECORDS TO AN INDEXED SEQUENTIAL ORGANIZED FILE (COLUMNS 16-18)

COLUMNS 16-18 MAY BE USED TO SPECIFY THAT AN OUTPUT RECORD IS TO BE ADDED TO AN INDEXED SEQUENTIAL FILE. THIS IS DONE BY _____ THE CHARACTERS ADD IN _____ 16-18, AND ENSURING THAT _____ 66 OF THE RELATED _____ DESCRIPTION SPECIFICATIONS CONTAINS AN _____.

A RECORD CANNOT BE _____ TO A FILE IN _____ SAME PROGRAM IN WHICH _____ FILE IS RETRIEVED OR _____. HOWEVER, ONE FILE CAN _____ ADDED TO AND ANOTHER _____ BE RETRIEVED IN THE _____ PROGRAM.

COLUMNS 16-18 MUST _____ BLANK IF THE OUTPUT _____ IS TO BE USED _____ UPDATE INDEXED SEQUENTIAL FILE.

_____ 1130 RPG THE KEY _____ FOR ANY INDEXED-SEQUENTIAL _____ MUST BEGIN IN

FIGURE 10 (CONTINUED)

POSITION _____ OF EACH RECORD. THIS _____ ALONG WITH THE LENGTH _____ THE KEY FIELD IS _____ ON THE FILE DESCRIPTION _____. IF THE PROGRAMMER DESCRIBES _____ KEY FIELD AS BEING _____ POSITIONS LONG, THE RPG _____ WILL USE THE FIRST _____ POSITIONS OF THE RECORD _____ BE ADDED AS THE _____ KEY FIELD. IN 1130 _____, THE KEY FIELD CAN _____ EITHER ALPHAMERIC OR NUMERIC, _____ IT CANNOT BE PACKED.

_____ CARD AND/OR PRINTER _____ USE THESE COLUMNS AS _____ IN THE FOLLOWING.

STACKER _____ (COLUMN 16)

CAUSES CARD _____ TO BE SLECTED INTO _____ OF A MULTI-STACKER OUTPUT _____ ATTACHED TO THE SYSTEM. _____ IS USED ONLY FOR _____ FILES OR COMBINED FILES. _____ ENTRY IN COLUMN 16 _____ BE ONE OF THE _____:

FIGURE 10 (CONTINUED)

- NUMBER OF THE STACKER _____ WHICH THE CARDS ARE _____ BE PLACED.
- BLANK OR _____, IF THE CARDS ARE _____ BE PLACED IN THE _____ STACKER.

NEW STACKERS MAY _____ SPECIFIED IN SUBSEQUENT OR _____. IF COLUMN 16 IS LEFT BLANK IN AN OR LINE, THE CARD IS DIRECTED TO THE NORMAL STACKER.

IBM SYSTEMS REFERENCE LIBRARY. IBM 1130 RPG LANGUAGE PROGRAM NUMBER 1130-RG-007. ROCHESTER, MINNESOTA, INTERNATIONAL BUSINESS MACHINES, 1972, P. 111.

FIGURE 10 (CONTINUED)

PLACING	FILE	DESCRIBED
COLUMNS	1	SELECT
COLUMN	ENTRY	RECORDS
FILE	OF	STACKERS
A	DESCRIBED	UNIT
ADDED	SPECIFICATIONS	IT
THE	THE	OUTPUT
THAT	5	THE
UPDATED	PROGRAM	MAY
BE	5	FOLLOWING
CAN	TO	INTO
SAME	NEW	TO
BE	RPG	1
RECORD	BE	TO
TO	BUT	NORMAL
IN	FOR	BE
FIELD	SPECIFICATIONS	LINES

IBM SYSTEMS REFERENCE LIBRARY. IBM 1130 RPG LANGUAGE PROGRAM NUMBER 1130-RG-007. ROCHESTER, MINNESOTA, INTERNATIONAL BUSINESS MACHINES, 1972, P. 111.

FIGURE 11: VIDEO DISPLAY TERMINAL

CLOZE TEST

CLEANING

THE VDT REQUIRES NO MORE CARE THAN A CONVENTIONAL ELECTRIC TYPEWRITER. KEEP IT CLEAN; KEEP _____ CONNECTORS PLUGGED IN; AND _____ ITS IMMEDIATE AREA CLEAR _____ ITEMS THAT MIGHT _____ WITH FREE AIR CIRCULATION.

_____ OFF THE DUST, LINT, _____, ETC., WHENEVER THEY BECOME _____, BEING CAREFUL NOT TO _____ DUST TO FALL INTO _____ KEYBOARD THROUGH THE SPACES _____ AND AROUND THE KEYS. _____ WIPING, USE A SOFT _____ DUST CLOTH OR DUST-FREE, _____, COMMERCIAL TISSUE. FOR STUBBORN _____, DAMPEN THE CLOTH OR _____ SLIGHTLY, BUT ONLY WITH _____ WATER OR A CLEANING _____ SUITABLE (SAFE) FOR USE _____ PLASTIC AND PAINTED SURFACES, _____ AS ONE OF THE _____ AVAILABLE ANTISTATIC CLEANING FLUIDS. _____ CLOTH OR

FIGURE 11 (CONTINUED)

TISSUE SHOULD _____ BE WET, JUST DAMP, _____ THAT IT WILL PICK _____ DUST OR DIRT READILY.

_____ OCCASIONAL LIGHT CLEANING WILL _____ ALWAYS PREVENT THE GRADUAL _____ OF A COATING OF _____ DIRT, PARTICULARLY ON THE _____, AND A MORE THOROUGH _____ WILL USUALLY BE NECESSARY _____ ONCE A MONTH. WIPE _____ SURFACES WITH THE ANTISTATIC _____ FLUID AND USE A _____ OF SOFT CLOTHS OR _____. USE ENOUGH FLUID TO _____ EACH CLOTH OR TISSUE _____ SO THAT VERY LITTLE _____ PRESSURE WILL BE NEEDED, _____ NOT ENOUGH TO ALLOW _____ UNDER THE WIPING PRESSURE. _____ CLEANING EACH SURFACE, WIPE _____ THE FLUID AND DISSOLVED _____ WITH A DRY CLOTH _____ TISSUE.

PAY PARTICULAR ATTENTION TO _____ DISPLAY AREA AND TO _____ KEYTOPS, WHICH RECEIVE THE _____ DEPOSITS OF DIRT.

FIGURE 11 (CONTINUED)

CAUTION

_____ NOT USE LIGHTER FLUID _____ OTHER PETROLEUM BASE CLEANERS _____ THEY WILL DAMAGE THE _____. DO NOT USE HOUSEHOLD PAPER TOWEL/NAPKINS TO CLEAN THE PLASTIC COVER OF THE VDT SINCE THEIR ABRASIVE CONTENT WILL SCRATCH THE PLASTIC CONTENT WILL SCRATCH THE PLASTIC SURFACE.

OPERATORS GUIDE, SYSTEM 610/730. TUSTIN, CALIFORNIA: BASIC FOUR CORPORATION/A MANAGEMENT ASSISTANCE, INC. COMPANY, 1979, P. 19-20

FIGURE 11 (CONTINUED)

ITS	ON	TISSUES
KEEP	SUCH	MOISTEN
OF	COMMERCIALLY	THOROUGHLY
INTERFERE	THE	WIPING
WIPE	NOT	BUT
SMUDGES	SO	DRIPPING
NOTICEABLE	UP	AFTER
ALLOW	THIS	OFF
THE	NOT	DIRT
BETWEEN	ACCUMULATION	OR
FOR	VARNISHLIKE	THE
CLEAN	KEYTOPS	THE
NON-ABRASIVE	CLEANING	LARGEST
ACCUMULATIONS	ABOUT	DO
TISSUE	ALL	OR
PLAIN	CLEANING	AS
LIQUID	SUCCESSION	FINISH

OPERATORS GUIDE, SYSTEM 610/730. TUSTIN, CALIFORNIA: BASIC FOUR CORPORATION/A MANAGEMENT ASSISTANCE, INC. COMPANY, 1979, P. 19-20

FIGURE 12: MDS DATA-RECORDERS
REFERENCE MANUAL CLOZE TEST
OPERATION

AFTER THE 6405 SYSTEM HAS BEEN SET UP ACCORDING TO THE PRECEDING STEPS, MOMENTARILY HOLD THE MODE SWITCH IN THE START POSITION, THEN RELEASE IT TO RUN POSITION. THE PAPER TAPE LEADER _____ "ALL DATA CHANNELS PUNCHED" _____ (7 AND 8 CHANNEL _____) IS MOVED FORWARD. THE _____ COUNTER DOES NOT ADVANCE _____ THE FIRST DATA CHARACTER _____ READ. WHEN THE FIRST _____ CONTAINING DATA HOLES IS _____, PAPER TAPE READING BEGINS; _____ FIRST DATA CHARACTER IS _____ THE FIRST DATA MEMORY _____ AND THE POSITION COUNTER _____ THE DATA-RECORDER ADVANCES WITH _____ SETTING OF THE 6005 _____ SWITCHES. IF THE LEADER _____ 5-CHANNEL TAPE CONSISTS OF "_____ BITS" PUNCHES, THESE FRAMES _____ READ AS DATA CHARACTERS. _____ THE LEADER ON 7- _____ 8- CHANNEL TAPE CONSISTS _____ "NO BIT" PUNCHES,

FIGURE 12 (CONTINUED)

THE _____ SWITCH MUST BE HELD _____ THE START POSITION UNTIL _____ AN "ALL BIT" OR _____ DATA CHARACTER IS ENCOUNTERED.

_____ TAPE READING CAN BE _____ AT ANY TIME BY _____ THE MODE SWITCH IN _____ STOP POSITION. WHEN THIS _____ IS PLACED IN THE _____ POSITION, THE CHARACTER BEING _____ IS ENTERED INTO DATA _____ AND THE PAPER TAPE _____ BEFORE READING THE NEXT _____.

WHEN A STOP OCCURS _____ PAPER TAPE STILL IN _____ PAPER TAPE READER, DO _____ SET THE TAPE READER _____ SWITCH TO OFF UNLESS _____ RECORDING HAS BEEN COMPLETED. _____ THE POWER SWITCH SET _____ OFF, THE TAPE READER _____ IS RELEASED AND MANUAL _____ OF PAPER TAPE CAN _____.

IF THE PAPER TAPE _____ RUNS OUT OF PAPER _____, OPERATOR ACTION IS REQUIRED.

FIGURE 12 (CONTINUED)

_____ THIS OCCURS, PLACE THE _____ SWITCH IN THE STOP _____. NOTE THE READING ON _____ POSITION COUNTER. ONE OR MORE OF THE FOLLOWING OPERATIONS MAY BE PERFORMED.

MDS 6400 SERIES DATA RECORDERS REFERENCE MANUAL. HERKIMER, NY: MOHAWK DATA SCIENCES, 1971, PP. 86,87.

FIGURE 12 (CONTINUED)

CONTAINING	IF	WITH
FRAMES	OR	THE
TAPES	OF	NOT
MEMORY	MODE	POWER
UNTIL	IN	DATA
IS	EITHER	WITH
FRAME	A	TO
ENCOUNTERED	PAPER	BRAKE
THE	STOPPED	MOVEMENT
IN	PLACING	OCCUR
POSITION	THE	READER
ON	SWITCH	TAPE
THE	STOP	WHEN
READER	READ	MODE
ON	MEMORY	POSITION
ALL	STOPS	THE
ARE	CHARACTER	

MDS 6400 SERIES DATA RECORDERS REFERENCE MANUAL. HERKIMER, NY: MOHAWK DATA SCIENCES, 1971, PP. 86, 87.

FIGURE 13: RECOGNITION CONTROL

CLOZE TEST

THE RECOGNITION PROCESS REQUIRES SPECIFIC PARAMETERIZATION INFORMATION FROM PROGRAM CONTROL. THE FONT SELECT REGISTER (rFS) _____ THE DATA SELECT REGISTER _____ DETERMINE WHICH FONT AND _____ DATA GROUPINGS WITHIN THE _____ WILL BE SELECTED FOR _____. RECOGNITION ALSO REQUIRES SERIF _____ SPACING INFORMATION FROM THE _____ CHARACTERISTICS REGISTER (rFC).

THE _____ DEVICE IN RECOGNITION IS _____ VIDEO SHIFT REGISTER (rVS) _____ FILLS UP (UNDER RECOGNITION _____) WITH A 32-BY-40 MATRIX _____ THE RESULTS OF THE _____ OPERATION (WITH SYSTEM 128 _____ BELOW THIS IS A _____ MATRIX). A 40-BIT VERTICAL _____ IN THE ASSOCIATED DATA _____ IS ALSO MONITORED BY _____ RECOGNITION HARDWARE.

RECOGNITION INVOLVES _____ PERFORMANCE OF A FEATURE _____ ON THE rVS MATRIX

FIGURE 13 (CONTINUED)

_____ IT IS BEING FORMED _____ DETERMINE WHETHER PRE-DEFINED FEATURES (_____ BIT COMBINATIONS) ARE PRESENT. _____ OF FEATURES ARE STORED _____ FONTS WITH UNIQUE COMBINATIONS _____ EACH CHARACTER. RECOGNIZING A _____ MEANS DETECTING THE CORRECT _____ OF FEATURES.

THE END _____ OF THE ENTIRE PROCESS _____ THE STORING OF THE _____ OR CONTROL CHARACTER CODE _____ THE CHARACTER ENCODE MATRIX _____ RETRIEVAL BY PROGRAM CONTROL. _____ RECOGNITION FLAG SIGNALS THE _____ OF THE RECOGNITION PROCESS _____ STOPS THE SCAN.

NOTE _____ THE RECOGNITION PROCESS IS _____ SIMULTANEOUSLY WITH THE SCAN _____ (AND NOT A SEPARATE _____). THE PROCESS IS AUTOMATIC (_____ BY THE HARDWARE) ASSUMING _____ PROGRAM CONTROL LOADS THE _____ REGISTERS AND REACTS TO _____ RECOGNITION

FIGURE 13 (CONTINUED)

INTERRUPT. PROGRAM CONTROL CAN INTERVENE BY READING THE VIDEO SHIFT REGISTER OR THE FEATURE BUFFER REGISTER FOR SPECIALIZED PROCESSING.

OCR SYSTEMS CONTROL PROGRAMMER INFORMATION MANUAL. SYSTEMS PUBLICATIONS, SCAN-DATA CORPORATION, 1971, P. 6-1.

FIGURE 13 (CONTINUED)

AND	PROFILE	DATA
RDS	COLUMN	IN
WHICH	THE	FOR
FONT	THE	A
RECOGNITION	ANALYSIS	END
AND	AS	AND
FONT	TO	THAT
KEY	UNIQUE	PERFORMED
THE	COMBINATIONS	OPERATION
WHICH	IN	ACTIVITY
MONITORING	FOR	PERFORMED
OF	CHARACTER	THAT
SCAN	COMBINATIONS	APPROPRIATE
AND	RESULT	THE
22-BY-40	IS	

OCR SYSTEMS CONTROL PROGRAMMER INFORMATION MANUAL. SYSTEMS PUBLICATIONS, SCAN-DATA CORPORATION, 1971, P. 6-1.

Exercise 3

Cloze the following passage and write out the instruction to the students regarding how they should proceed.

BASIC INPUT/OUTPUT

INTRODUCTION

Most data processing applications involve the basic operation of reading some type of data from an input device such as a card reader or a magnetic tape drive, processing the data in main storage, and writing some type of output on an output device such as a printer or a disk drive. The type of processing which occurs on the data which is read is, of course, dependent upon the requirements of the program and may consist of simple operations or very complex operations. The basic operation of read, process, and write, however, remains the same. Thus, before considering the logic which is required for processing data within main storage, it is first necessary to understand the basic input-output process.

In order to illustrate basic input/output operations, a flowchart will be developed for a program which is to read a file of data cards and create a printed report. The cards contain a Name field, an Address field, and a City/State field. The format of the cards are illustrated below. (Shelly, G.B.; Cashman, T.J.; 1978, p. 19)

Exercise 3: Answer Sheet

Instructions:

Words List:

The cloze procedure can also be used as a teaching technique. A variety of cloze modifications are useful for vocational teachers.

The changes in the procedure reflect the purpose of the exercise. If, for example, a data processing instructor wishes to highlight the procedures on a card reader and be certain that the student reading the literature understands what is being read, the passage can be "clozed," deleting those words which are critical to the card reader literature comprehension. The following card reader passage with "instructional modification" words (to be deleted) underlined illustrates the technique:

SAMPLE: INSTRUCTIONAL MODIFICATION CLOZE

> The card reader. Data is entered on cards by the manually operated keypunch machine. Once the data is punched into the cards, the deck is stacked into the hopper of the card reader (Figure 7.5). From the card hopper the cards are moved to the card-feed mechanism (Figure 7.6) past two brush-type or photocell-type reading stations. The brushes or photocells sense the presence or absence of the holes punched into the card and send electric signals to the computer. These signals, which form the external representation of data, are in turn converted by the computer into internal data representation.
>
> Observe the two reading stations in the figure. (Vazsonyi, A., 1977, p. 205)

Another modified cloze teaching technique is the "lexical cloze." Lexical is defined as relating to words of a language.

The lexical cloze involves deletion of words according to the kinds of words they are, such as nouns, verbs, adjectives, etc. A later segment of this booklet develops case grammar modifications utilizing the lexical cloze, establishing applicability for occupational education reading intervention. The example which follows illustrates use of subject deletions in a software application. The words to be deleted have been underlined:

> Software development. In the first-generation computers each step in a data processing task had to be programmed by the programmer. Later, software was developed to ease the programmer's burden; manufacturers provided software packages to handle such common data processing tasks as sorting, input, and output. The application programmer was relieved of these routine tasks, and programming time could be reduced.
>
> In the early days of computers each data processing job was also handled on an individual basis. The computer operator took the deck of cards for an application and ran it on the computer. Then the operator looked for the next job to be performed and ran that one. The computer was idle between jobs, and much expensive computer time was wasted. (Vazsonyi, A., 1977, p. 126)

When used as a teaching technique, the cloze procedure is easily adapted to provide for increasing degree of difficulty. Often vocational students have experienced a history of failures in reading. The pattern is conducive to diminished motivation in an attempt to read. In order to break the pattern and increase the likelihood of a motivated reader, a pattern of

reading successes is useful. Literature of any level of readability can be clozed. Thus, vocational literature at a low readability level can be used for those students who need a success stimulus. In addition, for teaching purposes, synonymous or words close to the correct word can be accepted. The number of clozed words can be decreased, instead of following a schedule. The next example illustrates this point:

POWER REQUIREMENTS

> POSITRAN is a multiprocessor micro-computer system which, like all computers, is dependent upon the local power environment for its operation. The restaurant electrical environment is subjected to transients created by the air conditioning, refrigeration, heating and cooking equipment. The general POSITRAN power requirements were created to protect the system from these transients.
>
> The entire POSITRAN system should have a separate isolated A.C. circuit with its own building ground. The input line should have transient suppressions. The A.C. circuit should be run in conduit which is not in close proximity to any other A.C. circuits.
>
> The following paragraphs describe the types of electrical interference that can occur, how they affect the input power, and how to protect the system. (Scan Data, 1979, p. 3-1)

For the word "transients," the student would be correct inserting "changes," for example. Note that only four deletions have been made and all are heavily clued.

CASE GRAMMAR AND THE CLOZE PROCEDURE

Gibson and Levin (1979) describe Fillmore's theory of case grammar. ". . . which imaginatively combines syntactic and semantic features." The study of meanings (semantics) and the orderly system of words (syntax) combine in Fillmore's Case Concepts (Brown, 1973). The theory of case gammar is easily adapted to teaching techniques using the close procedure. The following illustrations demonstrate the usage:

Agentive (A) - "The typically animate, perceived instigator of action."

(Systems Analysts) define and recommend new systems; estimate costs and benefits; design, implement, and modify systems; and hold overall responsibility for system performance. (Vazsonyi, A.; 1978, p. 25)

Instrumental (I) - "The inanimate force or object causally involved in the state or action named by the verb."

We believe that the computer offers great benefits at small risk; the challenge is to use it to the best advantage to enrich our lives. (Vazsonyi, A.; 1978, p. 29)

Dative (D) - "The animate being affected by the state or action named by the verb."

Computer operators are the people who see and touch the machine...(Vazsonyi, A.; 1978, p. 21)

Factive (F) - "The object or being resulting from the state or action named by the verb."

Programs written in these languages are compiled by a (machine language) program called the compiler into machine language programs (Vazsonyi, A.; 1978, p. 125).

Locative (L) - "The location or spatial orientation of the state or action named by the verb."

Channels are special-purpose computers, that is, they are input/output processors inserted between the main storage and other peripheral units (Vazsonyi, A.; 1978, p. 273).

Objective (O) - "The semantically most neutral case: anything representable by a noun whose role in the state or action named by the verb depends on the meaning of the verb itself."

A new development to help programmers make their jobs more interesting and more productive is called structured programming.

Benefactive (B) - "A noun deriving benefit of the action of the verb."

The central concept of data base management is to pool data for the many programs and store the data in data bases (Vazsonyi, A.; 1978, p. 330).

Comitative (C) - "In accompaniment."

The best central processing unit is useless without the appropriate input/output, auxiliary devices, and communication system to tie the units of the computer system together (Vazsonyi, A.; 1978, p. 202).

Temporal (T) - "When the verb is accomplished or occurs."

After the connections are made, you can transmit data to the computer or to peripheral devices...(Vazsonyi, A.; 1978, p. 240).

Modified cloze techniques can be used as introductory exercises, included in self-instruction packets, adapted for games, or structured for remedial work. They provide an excellent method of coordinating in-class vocational work and English or remedial reading treatment.

Exercise 4

Underline each word in the following passage which could be clozed by Fillmore rules, entering above the word the letter which indicates the rule used.

4.1.1 INTRODUCTION

The UNI-COLL system operates under the IBM Multiple Virtual Storage Operating System (OS/MVS) and the Job Entry Subsystem 2 (JES2). The OS/MVS system allows UNI-COLL to operate in a Multi-Processing (MP) environment, employing two interconnected processing units that execute the same workload simultaneously.

The purpose of MVS is to supervise and optimize computer processing by managing the allocation of system resources (i.e., central processing units, main storage, input/output devices, etc.) to the different jobs. The programmer communicates with the operating system describing the requirements for a particular job through use of Job Control Language (JCL).

JES2 is an integral part of MVS that provides for additional automation and control of the computing operation.

Essentially, JES2 operates as a programmed operator of OS/VS2, further optimizing the computer's resources. The programmer communicates with JES2 to define various aspects of job processing by means of JES2 control cards. These cards can describe the volumes that are to be mounted prior to execution, communicate special instructions for forms processing of print and punch output, specify the location to which print or punch output is to be routed, or send messages to the operator console at JES2 job input time, etc.

Jobs normally flow through the following five major JES2 processing phases:

4.1.1.1 INPUT

Jobs are read into the system from local card readers, remote terminals, and internal reader interfaces. Jobs are then entered into a queue to await processing by the next phase, which is normally the CONVERSION phase. If TYPRUN=COPY (see Section 4.1.5.1) was specified in the JCL, the job is immediately queued for the OUTPUT phase.

4.1.1.2 CONVERSION

The converter receives jobs from the queue built by the INPUT phase. Input JCL is merged with private and system PROCLIB JCL; this JCL is then scanned for syntax errors. Jobs with JCL syntax errors, or that have specified TYPRUN=SCAN

in their JCL, are queued for OUTPUT. Jobs that complete conversion successfully are queued for the EXECUTION phase. (UNI-COLL User Guide, 1979, p. 4-1)

SECTIONS 3 - 6

READING VOCATIONAL TEXTS

READING VOCATIONAL TEXTS

The following four sections each present a set of important content reading skills. Only those skills particularly relevant to vocational texts have been included. Moreover, each skill has been broken down into segments requiring no more than 5-10 minutes of class time every other day. All homework utilizes the text assignments you would normally require at that point in your course. Because students must pay careful attention to their text in order to complete the reading skill assignment, they should more thoroughly understand the content material than they ordinarily would.

Each section presents the given skill using a variety of vocational examples. Opportunities are then provided for you to apply the skills so that you can be assured of mastering each one.

Following the individual skill discussions is a section called "Textbook Application." It is here that you apply each skill to your own course textbook. This second application accomplishes three purposes: 1) It allows you to locate examples and sample exercises that you can use in your classroom, thereby greatly reducing extra preparation time reading instruction might entail; 2) It enables you to tailor the skills to your text; and 3) It gives you an additional practice opportunity, this time using the same materials your students will use.

At the end of each section are additional suggestions for teaching the new skills.

SECTION 3-6 TIME FRAME

SECTION		TIMING
3	Basic Vocabulary Skills	Weeks 1 and 2
	Formal definitions	
	Synonyms	
	Illustrations	
	Glossaries	
	Textbook application	
	Teaching students basic vocabulary skills	
4	Paragraph Comprehension	Weeks 3, 4 and 5
	Paragraph subject	
	Paragraph main idea	
	Textbook application	
	Teaching students paragraph comprehension	
5	SQYR	Weeks 6 and 7
	The SQYR method of study	
	Textbook application	
	Teaching SQYR	
6	Recognizing and recording complex information	Weeks 8, 9 and 10
	Classification	
	Comparison	
	Cause and effect	
	Textbook application	
	Teaching students to recognize and record complex information	

SECTION 3
BASIC VOCABULARY SKILLS

Section I

Vocabulary Skills

Central to data processing is its specialized technical vocabulary. Complete and rapid comprehension of this vocabulary is imperative for the student. This is particularly important because authors of occupational literature assume their readers have a basic understanding of important terms. Since it is essential for students to understand the technical terms in their field, most textbook authors have taken care to provide definitions and other comprehension aids. The simplist of these is the use of italics or boldfaced type to highlight important terms. Four other aids are discussed below: formal definitions, synonyms, illustrations, and glossaries. In some instances these aids are also used in the occupational literature.

Formal Definitions

Often an author will define an important technical term in the sentence or sentences that introduce it.

> The UNIT parameter is used in the DD statement to describe what kind of tape drive or direct access device is to be used for the data set. (UNI-COLL, 4-30)

term	definition
Unit parameter	describes tape drive or direct access device to be used for data set

RPG is another high level language designed specifically for report writing and file maintenance application. The language facilitates producing programs for a wide variety of reports ranging from a simple listing to a complete report that incorporates calculations and editing. (Shelly & Cashman, 1978, 1.5)

term	definition
R.P.G.	language for reports and file maintenance with editing and calculation

Message: BAD DESTINATION MSG CANCELLED

Meaning: Incorrect character keyed in the first position of N, ANS in a required keyed response.

(Scandata 2250/2. Key entry system, V-2)

Clue words warn the reader that a definition is included in the sentence. These include "is," "means," "is referred to," "is called," and "is defined as." Locate the technical term and its definition in the following examples (remember that a technical term may include one word or several).

Exercise 5

SCAN-DATA OCR systems are designed to operate in a computer environment, i.e. in an air-conditioned room of the type usually used for electronic data processing equipment that is reasonably free of dirt, abrasive material, and corrosive vapors. (Scandata 2250/1. II-1)

term	definition

Exercise 6

Duplicating. Duplicating is a high-volume process that generally involves the preparation of master copies such as stencils and plates. These are used to reproduce copies by means of ink or the transfer of dye. Included in this category are the well-known stencil, spirit, and offset processes.

In the stencil or mimeographing process, ink is forced from a saturated pad through a stencil as it is rotated on the drum of the duplicating machine.

The spirit process, often referred to as the hectograph process, employs special carbon paper containing aniline dye to produce a master from which an image is transferred to papers moistened with a special liquid.

Offset duplicating is a versatile method producing a high quality of work. Offset is the process used most often in data processing for the reproduction of documents, reports, and other materials where quantity and appearance are important factors. Continuous-form offset masters can be used with computer print out devices and other business machines to prepare data for reproduction.

In the offset process, the inked image is transferred from a master on one rotating cylinder to another cylinder wrapped with a rubber blanket. In turn, the blanket transfers the image to copy paper that is fed into the machine and pressed against the blanket by an impression cylinder. (Arnolds, Hill, Nichols, 1978, 67)

	term	definition
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____

Synonyms

As an alternative to a formal definition, a text may clarify a technical term by the use of a synonym. The synonym may be enclosed in commas or parentheses directly following the term or set off by the word "or."

> This configuration supports synchronous and asynchronous (stop - start) communications. (UNI-COLL, 1-3)

term	synonym
asynchronous	stop-start

Exercise 7

> In the verify mode, previously entered data are compared (verified) with the source documents and corrected if necessary. (Scandata 2250/2 System Engineering, 1-11)

term*	synonym

*be careful, this is tricky

> From the general conceptual point of view we are dealing here with a step-by-step procedure or process which transforms the input into output. (Vazsonyi, 1977, 42)

term	synonym

Mnemonics and Abbreviations

Data processing literature uses a special type of synonym in a manner unique to the field. The occupational literature is replete with abbreviations or mnemonics, most of which are defined only a few times. Students must be alert for the original

definitions, otherwise much of the remaining prose will be unintelligable. The following examples illustrate different ways the mnemonics are defined and then used without explanation.

> Associated with each terminal is a block of working storage belonging exclusively to that terminal called the terminal work area (TWA). (Scandata 2250/2 System Engineering, 2-2)

Mnemonic	definition
TWA	terminal work area

> If this occurs, the system must BREAK (that is give up control for one complete cycle through all terminals) until the first request is complete. (Ibid)

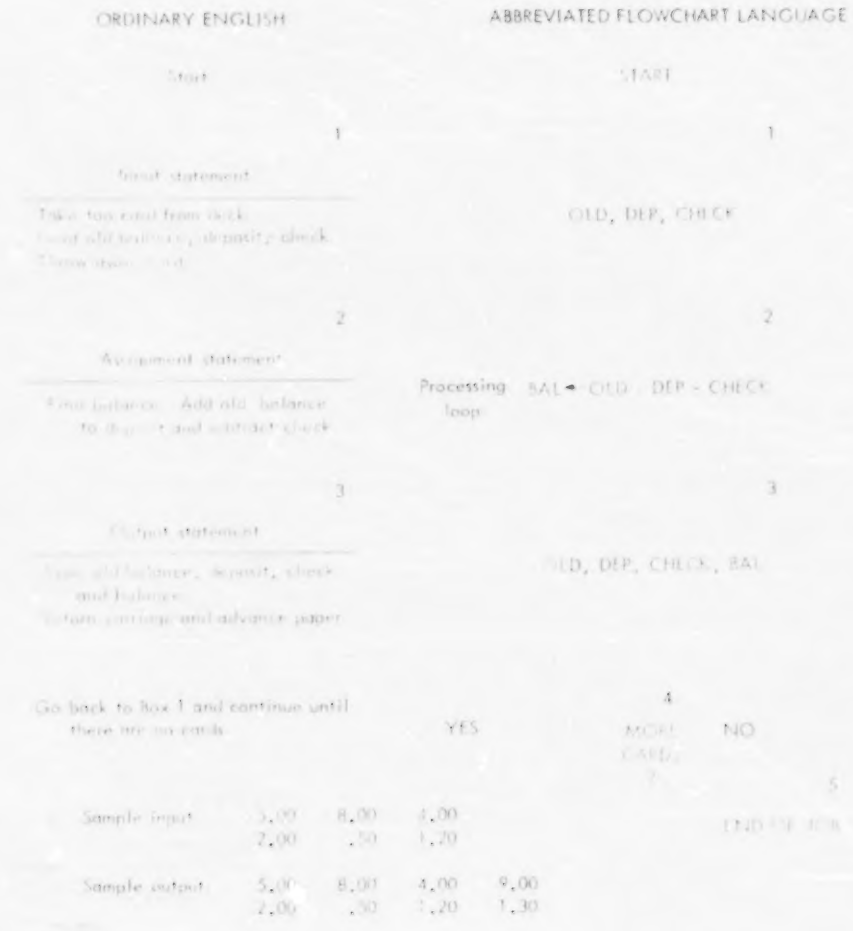
Mnemonic	definition
BREAK	give up control for one complete cycle through all terminals

> Temporary storage. TEMPS are those memory cells where intermediate results are held until they can be used later. If something is to be saved in one segment and recalled in another, it must be placed where it will not be changed during the intervening BREAK. This is the purpose of the TWA. The cells of a TWA belong to the terminal it is assigned to and the activity of no other terminal will affect them. TEMPS whose use is confined solely to one segment do not need to be reusable and may be taken from a global pool in page zero. (Ibid, 2-6)

Mnemonic	definition
TEMPS	temporary storage

Illustrations

Sometimes data processing literature makes use of illustrations to define important terms. Unfortunately, students often skip over the illustrations when they're reading. The first task of an instructor is to impress on students the need to immediately study the designated figure whenever it is mentioned in the prose (Ex: "See Fig. 8-2"). In the following example mnemonics are explained by an illustration.



(Vazsonyi, A.; 1977, p. 43)

S.3

While illustrations are used to supply definitions in data processing, they are more frequently used to explain procedures. It is of central importance that students make use of these explanations. Step one in the effective utilization of illustrations is to study the title, caption, or introductory sentences that state the purpose of the example and then analyze the illustration in light of this purpose. In Figure 14, an excerpt from Shelly and Cashman (1978, 1.11), students should try and match the errors diagnosed in the bottom section with the original incorrect source statements.

Other illustrations used in data processing involve more complex comparisons of different sample materials. Again in Shelly and Cashman (1978, 1.14 - 1.16) common related data processing materials are presented but this time five samples are given spread across 3 pages. Such a format demands that the student refer back and forth between pages. Active reading of this type may not be a habit and must therefore be emphasized in class. (See Figure 15)

Glossaries

Many current data processing texts include glossaries at the end of the chapter or book. The teacher's task is to make sure the students use this aid. In the initial weeks of a course students can be required to read the glossary the night before beginning a new chapter. Initially, as they read the

Figure 14: Illustrations

The following is a segment of a listing of a COBOL program generated by the computer and "diagnostics" or errors detected by the compiler. These errors must be corrected before the computer can execute the object program and process the data.

EXAMPLE

```
LINE NO.                    SOURCE STATEMENT                                    PAGE    1
      1          IDENTIFICATION DIVISION.
      2          PROGRAM-ID. 'PROG 1'.
      3          AUTHOR. ERC.
      4          INSTALLATION. LONG BEACH.
      5          DATE-WRITTEN. 04/20/70.
      6          DATE-COMPILED. 04/20/70.
      7          SECURITY. UNCLASSIFIED.
      8          REMARKS. INPUT NAME AND ADDRESS CARDS ARE USED TO PREPARE A
      9                   PRINTED REPORT.
     10          ENVIRONMENT DIVISION.
     11          CONFIGURATION SECTION.
     12          SOURCE-COMPUTER. IBM-360 E30.
     13          OBJECT-COMPUTER. IBM-360 E30.
     14          INPUT-OUTPUT SECTION.
     15          FILE-CONTROL.
     16              SELECT NAME-ADDRESS-FILE ASSIGN TO 'SYSCO2' UNIT-RECORD
     17                  2540R UNIT.
     18              SELECT PRINT-FILE ASSIGN TO 'SYSCO4' UNIT-RECORD 1403 UNIT.
     19          DATA DIVISION.
     20          FILE SECTION.
     21          FD  NAME-ADDRESS-FILE,
     22              RECORDING MODE IS F,
     23              RECORD CONTAINS 80 CHARACTERS,
     24              LABEL RECORDS ARE OMITTED,
     25              DATA RECORD IS NAME-CARD.
     26          01  NAME-CARD.
     27              05  NAME                    PICTURE X(25),
     28              05  ADDRESS                 PICTURE X(25),
     29              05  CITY                    PICTURE X(25),
     30              05  FILLER                  PICTURE 9999,
     31          FD  PRINT-FILE,
     32              RECORDING MODE IS F,
     33              RECORD CONTAINS 133 CHARACTERS,
     34              LABEL RECORDS ARE OMITTED,
     35              DATA RECORD IS OUTPUT-LINE.
     36          01  OUTPUT-LINE.
     37              05  FILLER                  PICTURE X.
     38              05  NAME-OUT                PICTURE X(25),
     39              05  FILLER                  PICTURE X(5),
     40              05  ADDRESS-OUT             PICTURE X(25),
     41              05  FILLER                  PICTURE X(5),
     42              05  CITY-OUT                PICTURE X(25),
     43              05  FILLER                  PICTURE X(47).
```

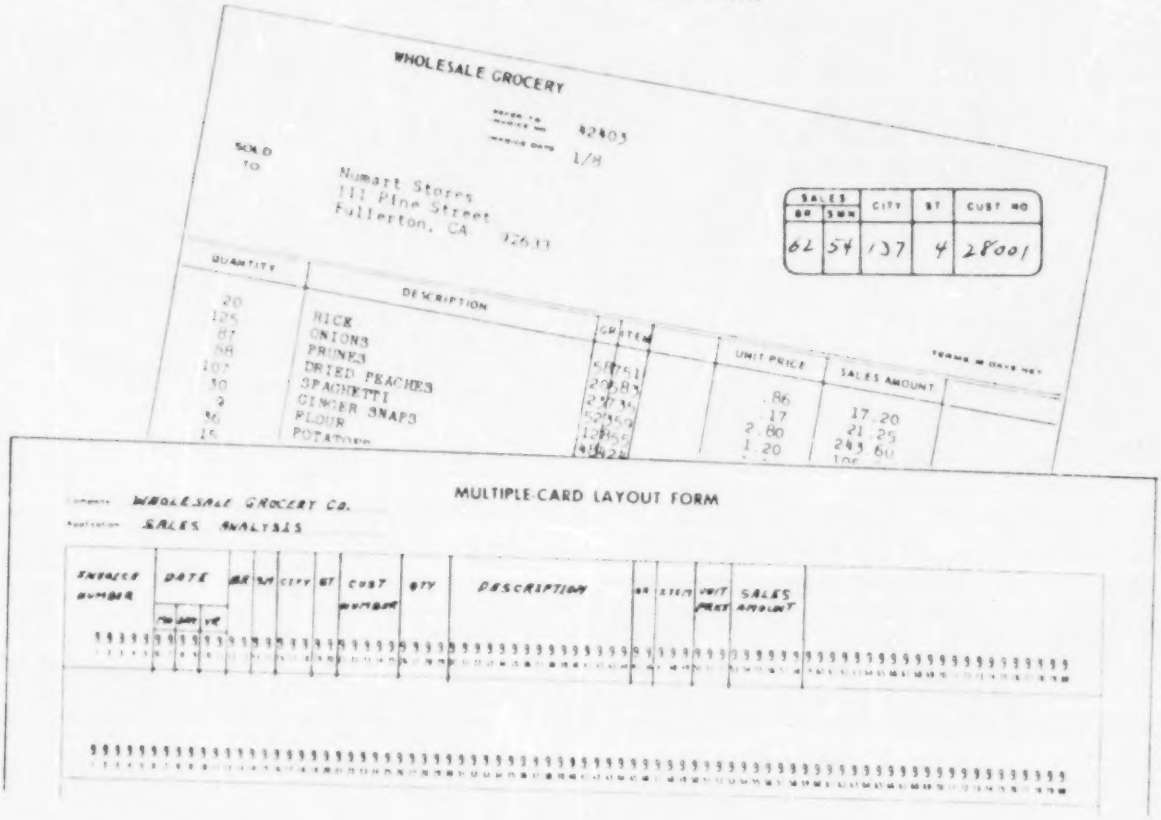
Figure 14 (Continued)

```
                PROCEDURE DIVISION.
BEGIN-JOB.
    OPEN INPUT NAME-ADDRESS-FILE, OUTPUT PRINT-FILE.
READ-CARD.
    READ NAME-ADDRESS-FILE, AT END GO TO END-OF-JOB.
    MOVE SPACES TO OUTPUT-LINE.
    MOVE NAME TO NAME-OUT.
    MOVE ADDRESS TO ADDRESSOUT.
    MOVE CITY TO CITY-OUT.
    WRITE OUTPUT-LINE AFTER ADVANCING 1 LINE.
    GO TO READ-CARD.
END.
    CLOSE NAME-ADDRESS-FILE, PRINT-FILE.
    STOP RUN.
```

```
                                    DIAGNOSTICS                                    PAGE    1

LINE/POS  ER CODE   CLAUSE          MESSAGE

  7- 3    IJS504I E PROGRAM-ID      '*ERROR 1**' IS AN INVALID EXTERNAL NAME FORMAT. RESTART WITH 'ENVIRONMENT'.

 98- 6    IJS606I E                 PROCEDURE NAME 'END-OF-JOB' NOT DEFINED.

 91- 9    IJS552I E MOVE            RECEIVING FIELD MUST BE A DATA-NAME. FOUND 'ADDRESSOUT'.

 83- 6    IJS594I E UNHANDLED       WORD 'LINE' WAS EITHER INVALID OR SKIPPED DUE TO ANOTHER DIAGNOSTIC.
```

Card Input

Figure 15: Illustrations



Sales Order and Multiple-Card Layout Form

Figure 15 (Continued)

Printer Spacing Chart

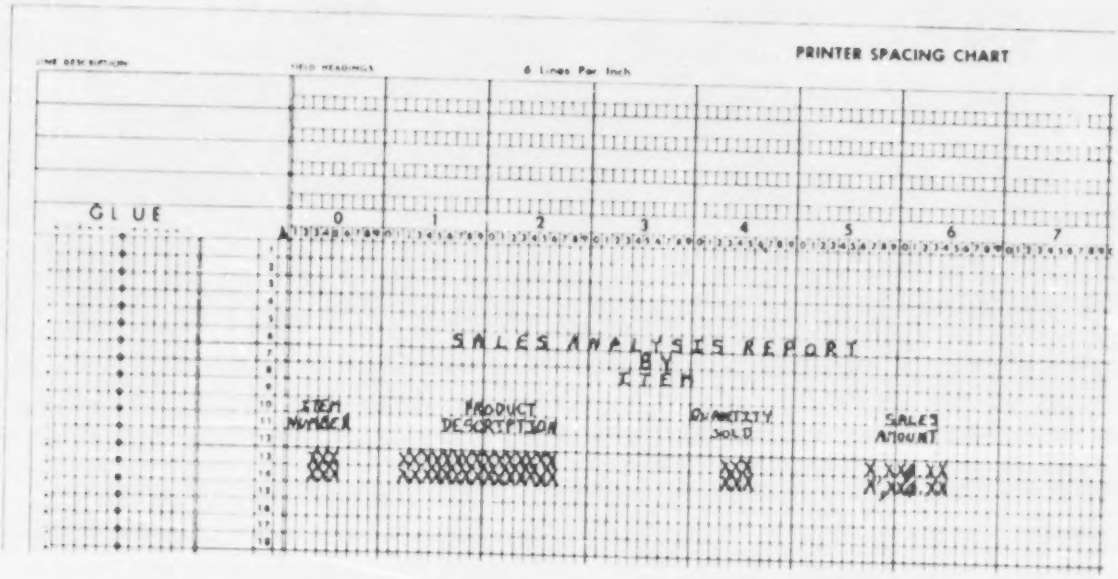


Figure 15 (Continued)

When the programmer writes the program to process the data to produce the report, the definition of the input and printed output will normally be in the form of a Multiple-Card Layout Form and a Printer Spacing Chart.

An example of the printed report and the actual card which would be used as a result of the layouts presented in Figure 1-12 are illustrated below.

EXAMPLE

Card Input

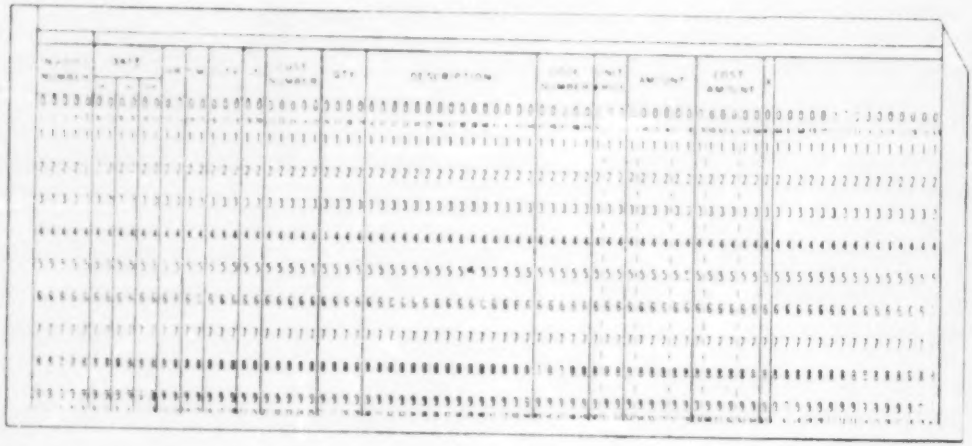
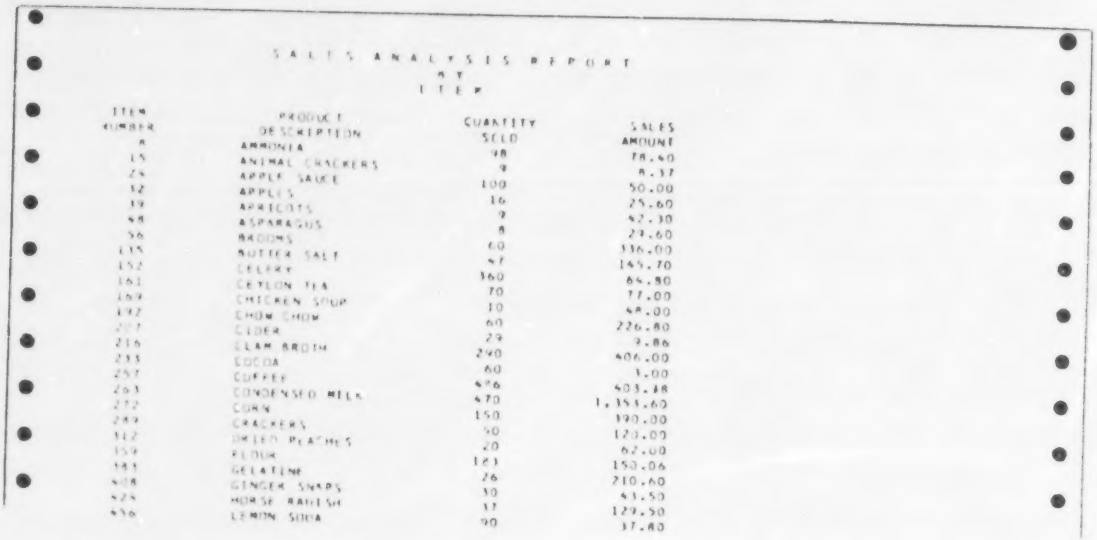


Figure 15 (Continued)

Printed Output



SALES ANALYSIS REPORT
AT
ITEM

ITEM NUMBER	PRODUCT DESCRIPTION	QUANTITY SOLD	SALES AMOUNT
8	AMMONIA	48	78.60
15	ANIMAL CRACKERS	9	8.37
25	APPLE SAUCE	100	50.00
32	APPLES	16	25.60
39	APRICOTS	9	42.30
48	ASPARAGUS	8	23.60
56	BROOMS	60	336.00
135	BUTTER SALT	47	145.70
152	CELERY	360	64.80
161	CEYLON TEA	70	77.00
169	CHICKEN SOUP	10	68.00
172	CHOW CHOW	60	226.80
207	CIDER	23	3.86
216	CLAM BROTH	240	406.00
233	COCOA	60	1.00
257	COFFEE	476	603.38
263	CONDENSED MILK	470	1,353.60
272	CORN	150	390.00
289	CRACKERS	50	120.00
312	DRIED PEACHES	20	62.00
359	FLOUR	123	150.06
383	GELATINE	26	210.60
408	GINGER SNAPS	30	63.50
424	HORSE RADISH	37	129.50
436	LEMON SODA	90	37.80

As can be seen from the example above, the Sales report which is generated from the program is in the same format as the printer spacing chart in Figure 1-12. The same is true of the input card. Thus, through the use of the record layout forms, the analyst informs the programmer of the formats of the records to be processed by the program.

chapter and encounter a new word defined in the glossary they can note it on a separate piece of paper. While the notation is not important in itself, the requirement of writing it will force them to actively use the glossary. This requirement and the assigned previewing can be relaxed later in the term.

Educated Guessing

Sometimes an author makes the meaning of a word clear, but doesn't actually define it. More frequently, a term is defined once early in the book, but will be used later without definition. Students may not remember the initial definition. Encourage them to skip a word they don't know, read the surrounding sentences and then make an educated guess as to its meaning. Students reading the following excerpt (UNI-COLL, 2-7) might not understand the words "Charging Algorithm." However, there are clues (see circled words) which suggest that the phrase has something to do with measuring and cost.

2.4 CHARGING ALGORITHM

The UNI-COLL charging algorithm is designed to reflect an equitable, competitive and reproducible (cost) for system resource usage while at the same time encouraging sound programming techniques in order to achieve maximum system throughout and responsiveness. The resource categories accumulated and (charged) for during job processing are as follows:

- CPU time is rounded to tenths of a second before charges are computed. Jobs submitted in non-Batch Monitor classes will incur a CPU assessment overhead of a half-second for CONVERSION processing (this includes TYPRUN=SCAN jobs), and a half-second for the INTERPRETER phase (see Section 4.1.1). If a JCL syntax error is discovered during CONVERSION, the job will be charged only a half-second of CPU overhead.
- Channel usage based on disk and tape I/O activity. DASD channel utilization is measured by the number of execute channel programs (EXCPs) issued during the job step. Tape drive channel utilization is measured by the actual duration, in seconds, of all start I/O commands (SIO) from issuance to channel end condition.
- Unit record activity charges will be made for the number of records spooled, cards read, lines printed, and cards punched. In addition, all print train, print form changes, and print and punch materials are charged for depending upon policies in effect at the individual remote site. Output produced at the UNI-COLL site will be charged for these resources.
- Storage units are computed on a step basis as a function of the requested region size and pseudo step time (PST). PST is the sum of the CEU time, DASD and tape channel time, and may be computed using the formula:

Exercise 8

In the sample paragraphs below an important word, one that might not be readily comprehended by students, is omitted. Circle other words that might help you ascertain its meaning and then check at the end of the section to see how close your guesses were.

> If the computer stops because of a program or equipment _____, a storage print out (dump) at the point of failure should normally be made. If the computer stopped because of a program error, the output, storage print out, and console readings at the time of the stop should be recorded and delivered to the programmer, at which point another job can be put into operation. In case of equipment failure, the equipment must be repaired and tested before operation can continue. Some computers have more internal checking systems than others. Those with good checking systems will stop at the point of _____ or record on the console or console typewriter the information required to diagnose the type of _____ and its cause. (Arnold, Hill, & Nichols, 1978, 315)

> Logic Instructions. Logic (decision-making) instructions enable the computer to _____ from the normal sequence of instructions in accordance with the existence or non-existence of certain conditions. If instructions always had to be followed sequentially in a fixed pattern, this would limit the computer to a single path of operation. The computer would not have any method of dealing with exceptions to a procedure and would be unable to select alternate paths, known as branches, based on conditions encountered while processing data. Moreover, a complete program would be necessary to process each record if it were not possible to repeat a given set of instructions. (Ibid, 233)

Glossary

	Pg. #	Terms found in the glossary (use each term only once)
1		
2		
3		
4		
5		
6		

Educated Guessing

	Pg. #	Term	Clues
1			
2			
3			
4			

Teaching Students Vocabulary Skills

Vocabulary skills can be introduced in the first week or week and a half of class. Every-other-day one skill can be explained and an example given. Three or four more examples can be given on a transparency, ditto, or the board while the class locates the term and definition in a discussion. As part of their regular homework assignment, have students practice these skills. Select five words that you know are explained by the skill taught that day (synonym, formal definition, etc.). Have students prepare a sheet similar to the one you completed in the preceeding text application section.

The cloze technique can also be used to reinforce or check the basic vocabulary skills. Prepare a clozed selection from your text, omitting important technical terms that are explained by one of the techniques discussed. This can be used to determine whether students use these comprehension aids or know the vocabulary. It can also be used to demonstrate to them the usefulness of learning these skills.

Exercise 9: Textbook Application

Select an introductory chapter from the vocational text you teach. Look for the vocabulary comprehension aids introduced above.

Formal Definitions

	Pg. #	Term	Clue word	Definition
1				
2				
3				
4				

Synonyms

	Pg. #	Term	Definition
1			
2			
3			
4			

Illustrations

	Pg.# term	Pg.# Ill.	Terms defined by the drawing or photograph
1			
2			
3			
4			

(Answers to Exercise 8:

Malfunction
Malfunction
Malfunction
Deviate)

SECTION 4
PARAGRAPH COMPREHENSION

Section 4

PARAGRAPH COMPREHENSION

A paragraph has three major components:

1) the subject (what is being talked about)

2) the main idea (the most important information about the subject)

3) the supportive information (facts or examples that make the information clearer)

Of these, the main idea is the most crucial, for the key points of a chapter or article are simply selected main ideas from component paragraphs.

Look at the following paragraph. What are the subject and main idea?

> Another function communication system elements perform is the processing of data. In this role the system element processes data into information, as we will discuss later in the section on data-processing system operation. The function may, of course, be performed by individual human beings, groups of individuals using various mechanical aids, or computers. Regardless of form, each of these data-processing systems performs a vital role in the communication system. (Alexander, 1974, 86)

On first inspection it appears that the subject is communication system elements. However, it is not simply a general discussion of these elements, but rather a discussion of one of their functions. The word "another" tells you that one or more other functions have already been presented, let us assume one such presentation. The subject, then, "communication system element

function #2." The most important information about this system, the main idea, is that "the system element processes data into information." The rest of the paragraph simply provides examples of processing data -- supportive information.

Paragraph Subject

The key to finding the subject of a paragraph is finding the one topic to which everything else in the paragraph is related. A paragraph usually discusses only one small aspect of a larger topic, therefore, the subject must not be too general. It must identify the specific topic being discussed. At the same time, it must not be too specific, substituting an example of the subject being discussed for the subject itself.

What is the subject of this paragraph?

> UNI-COLL offers customers the ability to allocate space and store data on direct access volumes (3330s) shared by the batch, TSO, and APLSV systems. The DD statement parameter "UNIT=OLS" (Online Storage) is used to allocate space on these volumes when using batch processing. When datasets are created via TSO or APLSV, no unit parameter need be specified. All datasets used or created interactively must be either on CLS or permanently mounted customer spindles. (UNI-COLL, 3-3)

Subject: a) UNI-COLL

b) "UNIT=OLS" (Online Storage)

c) allocation of space and storage of data

d) using OLS with interactive processing

Choices "a" and "c" can be eliminated because they are too general, the paragraph touches on only one small aspect of each topic. Subject "d" is too specific though; OLS is discussed in relation to types of data processing other than interactive. "Online Storage," "c," is the subject relating to everything in the paragraph.

Often subject identification is made easier by the use of sub-titles and/or introductory sentences as in the following paragraphs about memory organization and the definition of a communication system.

> 4.1 MEMORY ORGANIZATION
> PDP-8/A memory can be viewed as a series of storage locations with an octal number assigned to each location. This number is an address providing a means of specifying any memory location. For example, a 4K word (K=1024) memory could be shown as in Figure 4-1, with the octal addresses shown on the left and the corresponding decimal equivalents on the right. (Digital, 1976-77, 4-1)

> A basic communication system may be defined as two or more distinct information-generating subsystems operating in series with each other. These subsystems may be either human beings or electronic data-processing equipment. Under this arrangement the output of the first subsystem becomes the input to the second. The interface between the two is linked by the message that is transmitted. When additional information-generating subsystems are present in the total communication system, there will be an output-to-input interface between each pair of information subsystems in the series. In this way the total communication system may be viewed as a large complex of interrelated subsystems. The objective of the resulting supersystem is to impart knowledge, thoughts, ideas, perceptions, qualities, properties, or organized data among the individual systems. (Alexander, 1974, 86)

Paragraph Main Idea

Often it is difficult to identify a paragraph's main idea. The following three guidelines can help in its location:

1. If the paragraph includes the definition of a term, that term might be part of the subject. The definition might be part of the main idea.

2. If there are examples, these may be illustrating all or part of the main idea.

3. If a key word or phrase is repeated, it might be part of the subject or main idea.

4. Highlighted words might be part of the subject or main idea.

Note that the word "might" is used in each instance. These guidelines can point toward possible main ideas they cannot automatically select the right one.

Exercise 10

Look at the following paragraphs. First ask yourself what the paragraph is about (the subject). Then look for the main idea using the four guidelines. Note which guideline is most helpful in each case (in some cases none may apply).

Remember that the main idea contains the most important information about the subject. This information may be clearly stated at the beginning or end of the paragraph, scattered throughout, or merely inferred.

> Organizational information systems encompass all of the information flows down from top management and the responses of lower-level employees up to top management. The managers at all organizational levels are ultimately responsible for

planning, organizing, directing, and controlling the activities of their organizational units. Managerial directives must be communicated from the top-level managers, perhaps through several managerial levels, to the employees of the firm. In order to exercise control, there must be a reverse information flow to give management feedback about the activities being performed at the lower levels. The organizational information system then is simply a collection of different channels or media for transmitting information from the top of the organization to the bottom and back up to the top once more. (Alexander, 1974, 93)

Guideline #	Subject	Main Idea

By program implementation, we mean the task of actually converting a problem solution, existing perhaps in the form of a flowchart, into a computer program. This task involves a number of clearly identifiable steps. The first of these id coding; in other words, actually writing the instructions. It's a rare programmer who can write error-free code; thus a second step in this process is program debug, which simply means removing the errors (or bugs) from the program. The final step is program testing. In this step, the program is used to process realistic, representative data, and the results are compared with expected results. These three steps overlap a great deal, with errors frequently being detected during testing and removed (debugged) by recoding portions of the program. (David, 1978, 218)

Guideline #	Subject	Main Idea

8.2 PROGRAMMED DATA TRANSFER
Programmed data transfer is the easiest and most common means of performing I/O. Each input/output transfer (IOT) instruction initiates one programmed transfer which may transmit data or status information either to or from a peripheral device. The amount of information that will be transferred by an IOT instruction depends upon the particular operation that is coded into the instruction and the design of the I/O device interface. In general, programmed data transfers are limited to a maximum of 12 bits of information per IOT instruction. (Digital, 1976-77, 8-1)

Guideline #	Subject	Main Idea

Since maintenance begins after the program has been written, it involves some special problems. The original programmer may well have forgotten the program, hence needing a refresher, or he or she may have left the organization, meaning that someone else must find and fix the bug or make the modification. If a program is to be successfully maintained, it is essential that a very clear and complete description of the logic of the program be available. (David, 1978, 218)

Guideline #	Subject	Main Idea

4.1.5.3 JES2 /*SETUP Card
A /*SETUP card is used to inform the operation of those tape and disk volumes that are to be mounted for the job. There must be a separate /*SETUP card for each volume to be mounted except when setup by dataset name is utilized (see "dataset name," below). The /*SETUP card(s) can be placed anywhere within the JCL for a job; however, the /*SETUP card(s) must not occur before a JOB card, or between a "DD *" or "DD DATA" statement and its corresponding

delimiter. It should be noted that a job will be cancelled if it requires volumes to be mounted and the /*SETUP card is omitted or coded improperly. (UNI-COLL, 4-14)

Guideline #	Subject	Main Idea

Paragraph Comprehension and Illustrations

Paragraph comprehension can be reinforced by the proper use of illustrative material. Data processing relies heavily upon various types of flow charts. Students must understand that these charts present sequential information and should, therefore, be "read" in the intended sequence. They should also develop the practice of reading the diagram and the prose in an integrated fashion. In the following example (Arnold, Hill, Nichols, 1978, 120-121) write the number of each step discussed in the prose on the appropriate part of the diagram.

COMPUTER FUNCTIONS

The ability to compute is only one of the functions of an electronic data processing system. The other basic functions are data storage, control, and communication. These functions enable electronic computers to process data in the following steps:

1. The data to be processed and the instructions for processing it are recorded in an input medium such as punched paper tape, punched cards, magnetic tape, magnetic ink characters, or optical characters.

2. The instructions and data are fed into an input device, where they are automatically converted into electrical impulses. The instructions and data are then routed to the main storage or memory unit, where they are held until needed. Data also may be stored in an external or auxiliary device.

3. Instructions are accessed and interpreted by the control unit of the computer, which directs the various data processing operations by issuing commands to all components of the system.

4. In accordance with instructions, data is transferred from storage to the arithmetic-logical unit of the computer, where arithmetic operations or comparisons are performed as directed by the control unit.

5. Processed data is routed to the storage unit, where it may be held for further processing or moved to an output device, again as directed by the control unit.

6. Data emitted from storage is recorded by an output device in a medium such as punched tape, punched cards, magnetic tape, or printed documents.

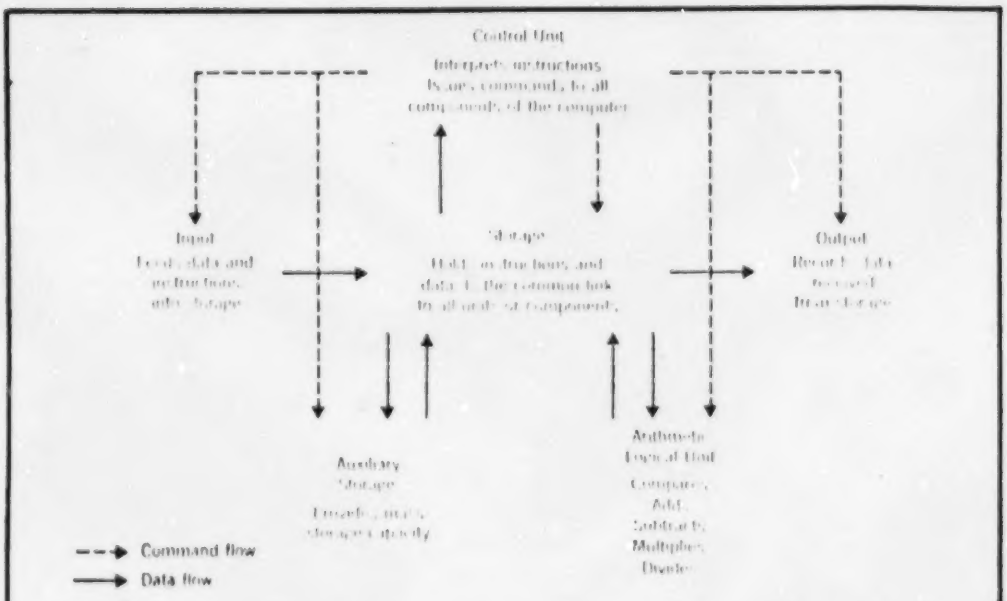


Figure 6-4. Relationship of functions of a computer system.

The relationship of these functions is illustrated in Figure 6-4. This diagram depicts the significance of the storage unit as a common link between all units or components of the computer. It also shows that all units operate under the direction of the control unit as it receives and interprets one instruction at a time. These functions will be described in greater detail in the following chapters.

A method of representing data that is acceptable to the system is essential for performance of the functions outlined above. We shall now consider methods of data representation.

Although students cannot write in their texts, dittos or transparencies of selections can be made so that they can practice cross-referencing the diagram and the prose.

Exercise 11

As an example, cross-referencing has been started on the following selection. Finish the task and then cross-reference the second selection.

Aside from the sheer volume of data, we might ask what there is about processing data that consumes so much time and effort and creates such a need for mechanical and electronic devices. Actually, from the time of origin to the time of arrival in a final, more useful form, data may go through a number of operational steps referred to as the data processing cycle. This cycle may be roughly divided into the following steps: origination of data, data recording, data manipulation, report or document

preparation, data communication, and data storage. These steps are illustrated in Figure 1-2.

Origination of Data

The raw meterial for data processing originates on various business forms, often referred to as source documents. This original data might be handwritten, typewritten, or prepared in a variety of other ways. For example, payroll

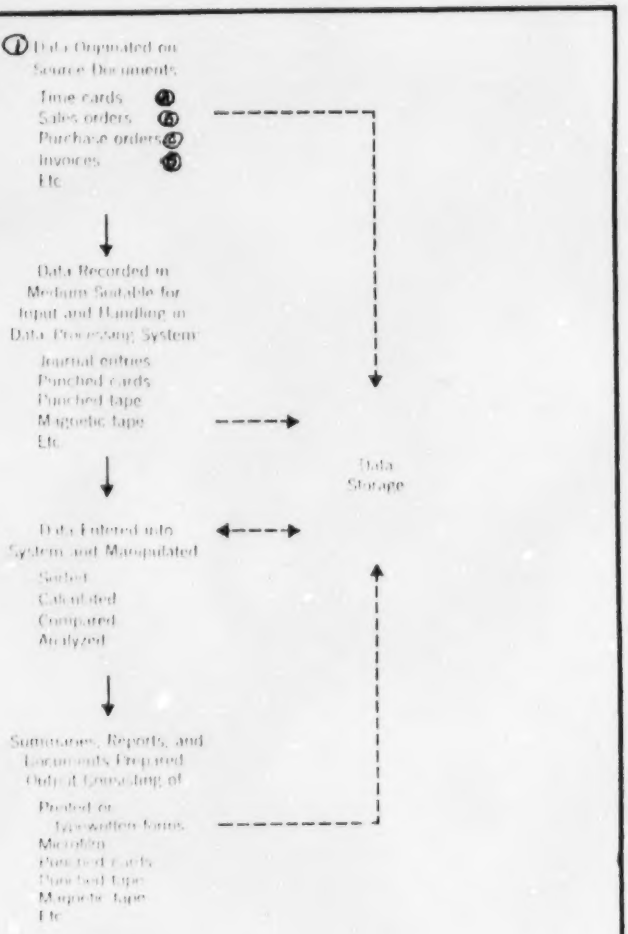


Figure 1-2. Steps in the data processing cycle.

time data might be handwritten by the worder on a timekeeper, stamped in numerals by a time clock, or punched into a card. Other examples of source documents include sales orders, purchase orders, invoices, and material requisitions. These original documents are especially important for two reasons: (1) they provide verification of all transactions, and (2) they are the basis for all further actions.

Recording Data

The basic function of this step is recording data in some form that allows it to be handled conveniently in whatever system is being used. This might involve making a manual entry in a journal or register of some type, punching holes in a card, punching holes in paper tape, recording magnetized spots on magnetic tape, writing or printing data in magnetic ink, or using some other medium acceptable to the system as a means of entering and later transferring the data from one step to another (Figure 1-3).

In some cases recording may be combined with the preparation of original documents through a technique called source data automation. For example, by using a typewriter equipped with a magnetic tape recording device, it is possible to prepare simultaneously a typewritten

document, such as a sales invoice, and a magnetic tape containing the same or selected data. Thus, the original data is automatically recorded in machine language for entry into a computer system.

Data may also be recorded and transmitted directly into a data processing system without the need for document preparation. For example, the time reporting discussed in the preceding section could be accomplished by inserting the worker's coded badge on identification card into a data collection device capable of reading and transmitting directly to a remote computer the data about the employee and his time of arrival or departure (Figure 1-4). In some computer systems data is entered directly into the computer through a typewriter-like console keyboard.

The following steps can also be important parts of the data recording function.

Editing. This is the process of selecting significant data and eliminating data that does not need to be recorded for further processing.

Coding. As a means of further reducing the amount of data to be recorded and processed, abbreviated codes are often used to condense the data. The technique of converting data to symbolic form has been used in many fields

as a means of saving time, effort, and space, and as a convenient device for identifying and distinguishing data. The most familiar types of codes used to express words or ideas are the alphabetic, which consists of letters; the numeric, in which numbers are used; and the alphanumeric, which used both numbers and alphabetic characters. The designation of units in a large organization as departments A, B, C, etc., is an example of the use of alphabetic code. Examples of the use of numerical codes include credit cards, bank accounts, and social security numbers.

Classifying. Classifying is the process of identifying one or more common characteristics to be used as a means of systematically grouping data into classes. Categories might include type of product, location, department price range, etc. Classifying may occur as a separate step. However, since the need is usually anticipated at the time data is recorded, classifications are generally determined and entered as part of the recording process.

As defined here, classification is an initial step that precedes the actual sorting of data. For example, classifications such as department number, age group, sex, etc., may be entered on personnel records even though the records are to be filed alphabetically. The

presence of such classification data makes it easy to rearrange records at any time for statistical or other purposes.

Codes are used extensively as a means of identifying different classes of data. Numbers or letters of the alphabet, or a combination of both, can be assigned to previously planned classifications to provide quick recognition and ease in writing. For example, the names of the states are frequently designated by code numbers such as 01 = Alabama, 02 = Alaska, etc.

Conversion. Conversion is a means of transforming data from one recorded form to another. For example, data recorded in punched cards may be converted to magnetic tape, or vice versa, by the use of special equipment designed for this purpose. Such conversion changes the recorded form of data but not the nature of the data. Conversion, as well as re-recording in the same form, may occur at various times during the processing cycle.

Copying and Duplicating. These are processes by which facsimiles of data can be prepared for distribution to more than one user or for use in different steps in the processing cycle.

Verifying. This essential function assures that all parts of the recording process have been accomplished without error, and that accurate data is entered into the processing system.

Manipulation of Data

If the original form of data were suitable for all purposes, less processing would be necessary. Seldom, however, can the real objective of a transaction or situation be attained without converting data into a more useful form. This conversion is accomplished by means of one or more of the following procedures.

Sorting. Sorting is the process of arranging or selecting data according to (1) order or rank or (2) common characteristic. Sorting according to order or rank, known as sorting in sequence, takes place when data is arranged in numeric or alphabetic sequence. Sales invoice data, for example, might be arranged according to sequence of invoice numbers or customers' names. Sorting according to common characteristic, known as sorting by classification, takes place when data is arranged in similar groups. For example, customers could be classified by geographic area, by salesman, or by type of business. Like other steps in the processing cycle, sorting is simplified by expressing data in codes.

Comparing and Analyzing. By these processes we determine such factors as the nature, proportion, relationship, order, similarity, or relative value of data.

Calculating. Calculating refers to the arithmetical processes of multiplication, division, addition, or subtraction, which are necessary to convert data into a more significant form. For example, an employee's weekly hours of work and his hourly rate of pay become much more significant when they are multiplied together to determine his weekly earnings.

Summarizing and Report Preparation

Summarizing. Summarizing is the process of condensing data so that the main points are emphasized. Summarizing generally involves listing or tabulating data and totaling each list. The running of a list on an adding machine is one form of summarization.

Summarizing is related to sorting since the arrangement of data into categories is usually part of the summary process. The sorting operation in itself may be meaningless, however, unless the results of the separation are known. Summarizing carries the process one step further by providing totals to indicate the individual or comparative values of various classes of data. As an

illustration, the daily sales of a store may be listed by departments. This operation achieves a distribution of sales data. However, the relative performance of each department cannot be ascertained at the end of a weekly or monthly period until the data is summarized by totaling each list. Thus, the detailed lists are condensed into totals that provide management with useful information.

Report Preparation. The processed information that results from the data processing cycle is known as output. This could include documents such as payroll checks or statements of account; or finished reports such as a sales analysis, expense distribution, inventory, or weekly payroll. The means by which the processed information is finally recorded is known as the output medium. Depending on the type of processing system being used, output media could consist of typewritten documents or reports, printed forms, punched cards, punched paper tape, magnetic tape, or other special forms.

Data Communications

Communication is the process of transferring data from one point to another during the processing cycle or of delivering the final results to the user. Many methods may be used, ranging from the very simple to the highly complex. Data in written, punched card, or other form may be transported

internally by hand or by a conveyor mechanism of some type. Externally, data is often transported by mail.

Almost any process of transmitting information may be considered a form of data communications. However, in this period of advanced technology the term "data communications" generally refers to the electrical transmission of data that has been transformed into a special code. It is now possible to transmit data between a wide variety of devices, internally or externally, by direct connection or by means of telephone circuits, telegraph circuits, or microwave. Teletypewriter service is probably the most familiar example of wire communication. This method enables data in typewritten, punched tape, or magnetic tape form to be transmitted between units in the same building or city, or thousands of miles apart (Figure 1-5).

Data Storage

Upon completion of the processing cycle, or possibly at a point of intermediate results during the cycle, data must be stored so that it is readily retrievable. The storage of data is a matter of monumental proportions in some organizations. This is especially true of certain governmental agencies and business firms that have a large number of documented transactions. It is of utmost importance in such organizations to design a storage system

that will facilitate the retrieval of data needed for current operations and safeguard data that may be needed for reference in the future. Storage techniques depend, of course, on the type and volume of data involved.

In conclusion, let us emphasize that the steps of the data processing cycle outlined above are the basic elements into which all data processing problems subdivide. All or some of these functions have to be performed whether they are done manually, by mechanical means, or by electronic computer. In spite of the vast differences in these methods, however, the objective of data processing remains basically the same -- the conversion of data to useful information.

Now, cross-reference the following: (Figure 2-11 is included in Figure 16)

2.4.1 KEYSTROKE PROCESSING (Scandata 2250/2 System Engineering, 2-114-215)

Keystroke processing (see Figure 2-11) begins with a key depression at a terminal. This results in an interrupt which is acknowledged by the process and results in storing the character in a five character, key-stroke buffer (KSTRK BUF). The EXEC module is altered to this event.

Figure 16: Cross-Referencing

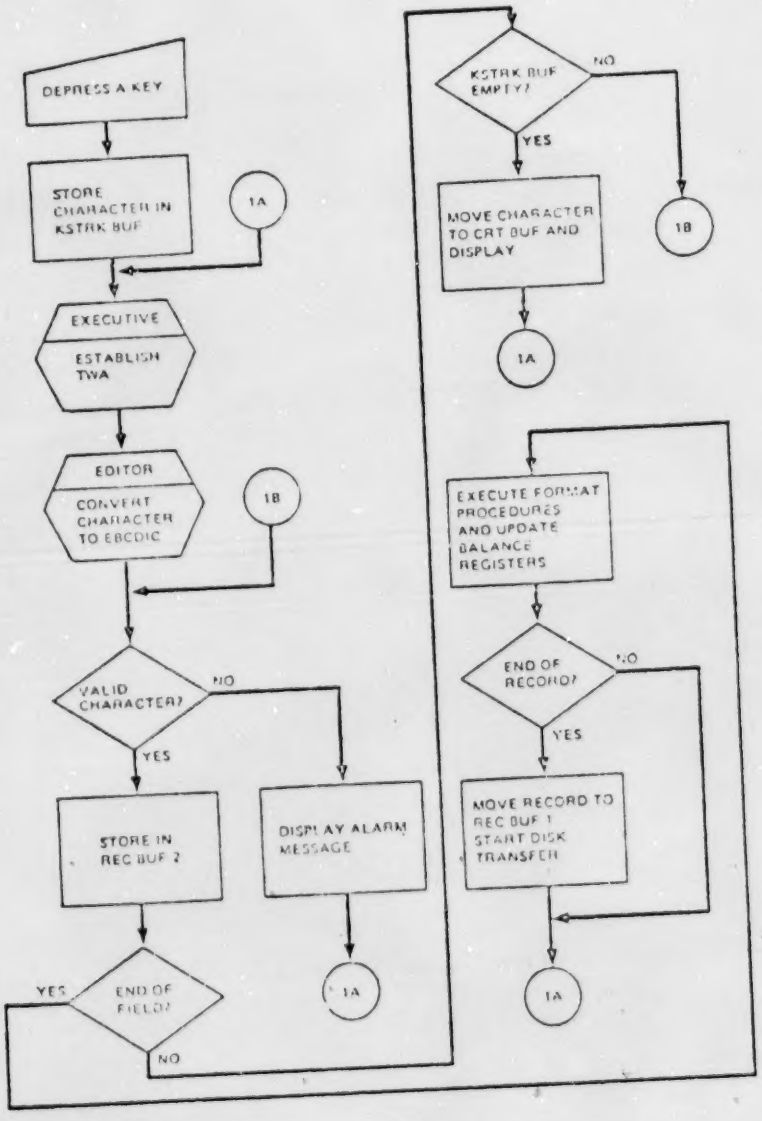


Figure 2-11. Keystroke Processing Data Flow

The executive, at the time slice allocated for that terminal establishes a terminal work area (TWA) and passes control to the EDITOR. The TWA includes record buffer 1 and record buffer 2 and the sector buffer. The record buffers are used to accumulate and process data. The sector buffer is used to attain maximum disk efficiency.

The EDITOR converts the incoming character to EBCDIC and initiates a work sequence.

During the work sequence initiation, characters are accumulated in CMMD BUF and the requested work type is evaluated. Once the work type is established, batches are opened and format programs are loaded followed by normal data gathering.

Characters continue to be routed by the EXECUTIVE to the EDITOR. The EDITOR validates each character according to the format specification. If the character is valid, it is stored in REC BUF 2. Otherwise, an alarm message is displayed on the CRT. The end-of-field is checked and if not at the end of the field, KSTRK BUF is checked for additional characters to be processed in the same manner. If SKTRK BUF is empty, the accumulated characters are moved to CRT BUF for display and control is passed on to the EXECUTIVE.

At the end of each field, format procedures are executed and the balance registers are updated. Any alarm, DUP, or DISP procedures are executed at this time. The processing of fields continues in this manner until an end of record is reached.

Exercise 12: Textbook Application

Pick four paragraphs from your fourth week's reading assignment. Identify the subject in each.

Page #	Col. #	Para. #	Subject

Pick four paragraphs from your fifth week's reading assignment. Identify the subject and main idea in each.

Page #	Col. #	Para. #	Subject	Main Idea

120

Pick a segment at least four paragraphs in length from your sixth week's reading assignment and note the subject and main idea of each important paragraph.

Page #	Subject	Main Idea

Pick two text selections that correspond to flow charts or other sequential diagrams from the fifth, sixth, or seventh weeks assignment (if possible). Note the page number of the prose and diagram.

Page # Diagram	Page # Prose	Title Diagram

Teaching Students to Understand the Paragraph

Understanding the paragraph is the most difficult reading skill the vocational instructor must teach. It is important to introduce the material slowly and incrementally as was done here. The fourth week of class can be devoted to the paragraph subject. Monday 5-10 minutes can be spent in a general introduction and discussion/practice locating subjects in simple sample paragraphs. Wednesday the three criteria can be applied to more sample paragraphs and students can look for the subject in specified paragraphs from the homework reading. Friday a few of the homework paragraphs can be discussed and one or two more complex samples given. Friday's homework can include 1-3 more paragraph assignments.

During week six, a similar procedure can be utilized to teach locating the main idea. Each day one of the three clues can be introduced and applied along with the more general directions of "what is the most important thing the author is saying in this paragraph." The paragraphs you identified in the text application can be assigned to the students with directions to find the subject and main idea. In the sixth week the class can be assigned the multiparagraph sections you identified, recording the subject and main idea just as you did. They can also practice integrating the reading of illustrations and prose.

SECTION 5
EFFECTIVE READING TECHNIQUE

Section 5

EFFECTIVE READING TECHNIQUE

In all subjects, the time comes when we ask our students to study by themselves. In many instances, these students do not know how to study. This section contains a brief overview of a study technique originally devised by Francis Robinson (1970).

The SQ4R Method of Study

Many elementary, secondary, and college students have not learned how to study a textbook assignment. A typical procedure is for the student to do nothing more than open his book and read the assignment. The more conscientious may follow this initial reading by a second or even a third reading of the same fruitless type. Research has found a good method of helping the student read a given selection with better understanding and better recall. It is called the SQ4R method. It involves five basic steps: (1) Survey, (2) Question, (3) Read, (4) Recit, (5) Review. Some of the things to be done in each of the five steps are discussed under appropriate headings below.

Survey:

> Look through the whole assignment. Read the headings if there are any; read the summary if there is one. Try to get the general idea of the content of the whole lesson. Later you can piece the details into the framework which you have in mind, and the entire lesson will mean more.

Question:

Think of the questions which are likely to be answered in the lesson. Often the headings can very easily be turned into questions. Use them! If any heading does not tell you plainly what question is to be answered in that section use this question: "What does the author expect me to learn about from studying this section?" If there are no paragraph headings, skim the section quickly for the main ideas.

Read:

Study the lesson to find the answers to the questions. Do not stop to read every word carefully, concentrate on finding the main point. You cannot remember all the facts you find, so you want to look for the important ones, of which there will be only one or two for each section. Don't pick out too many. Do not try to memorize the facts at this point; just sort out the ones you need as you go along.

Make study guides. Fold or rule a large-sized notebook paper lengthwise down the middle. On the left, list the topics discussed in the book. If there are paragraph headings in boldface type, use them. If not, list the main ideas found in the preliminary survey. Leave space between topics. When you have finished reading a section and picking out the one or two points to remember, list on the right the key words of the ideas or facts you have decided are most important for each topic. Do not do this until after you have read a section and thought about it. This is most important.

Recite:

Go back over the lesson immediately. Cover the right hand side of the paper and check the headings on the left. Ask yourself, "Do I remember what this section was about?" or "Can I answer this question?" If you find that you cannot you know that you must look at the key words, or even go back to the book if necessary, in order to restudy the particular part which you did not understand or have forgotten. Step 4 is very important. Giving yourself an immediate quiz on what you have just studied is the best possible way to prevent forgetting.

> Practice until you can recite on the entire study guide without referring to the key words. Then practice some more. This extra practice is what really pays off.

Review:

> Some time later, and always before an exam, go back to your headings and questions and quiz yourself. Reread only those parts which you have forgotten. If you have taken steps 1, 2, 3, and 4 faithfully, you will find that you do not have too much to restudy.

If students learn to change the headings within a chapter to questions and then read to answer those questions, much more will be obtained, than if they merely read and then answered questions at the end of the chapter. Indeed, what often takes place when we assign questions from the chapter ending is students read the questions and then copy only that information which answers the question without ever having read the chapter or designated pages. The process of formulating questions is a thinking exercise which tunes students into the assignment. Reading, studying, in this way is a life-long skill that really should be taught. As a skill, it may be more important than the content and concepts of the subject.

Occupational Literature Application

The occupational literature in data processing consists heavily of computer-generated user's guides. These generally include a detailed table of contents and a number of short, titled, topics per page. Seldom do users read the entire quide at one time. Rather, they use only those sections needed to solve

a particular problem. Efficient use of surveying techniques (1. surveying the table of contents, and 2. skimming subtitles) can facilitate this process.

Exercise 13: Textbook Application

Select a portion of the chapter you assign in the seventh or eighth week of class and practice the SQ4R method.

Teaching SQ4R

Students have already learned how to locate the subject and main idea of a paragraph and how to distinguish these from information that is merely supportive. In the final "paragraph" assignments they practiced recording information in much the same manner as they will for SQ4R. This should facilitate SQ4R instruction. On Monday explain surveying and have the students practice in class on the chapter currently assigned. Wednesday have them prepare questions from some of the headings, either individually or as a group. They can continue this exercise for homework. Friday the read and record steps can be presented and compared with the subject/main idea work they have already done. Reading and recording can be practiced on the homework assignment and discussed the following Monday.

Teacher-made notes on the reading can be shown on a transparency, on the board, or a ditto to allow students to check their own notes. Wednesday the recite and review steps are introduced with students pairing-up to quiz each other from the left-hand subject

column. Beginning Wednesday night, they should be expected to utilize the SQ4R method on their assignments. The next two Fridays, and sporadically thereafter, students can quiz each other on their notes while the instructor walks around the room noting whether each student has followed the correct procedure. At the beginning of the next chapter, students should again be required to perform the survey step in class and suggest some guide questions derived from the chapter headings. Review of the other steps should take place as needed.

SECTION 6
RECOGNIZING AND RECORDING COMPLEX INFORMATION

Section 6

Recognizing and Recording Complex Information

Data processing literature often highlights three important logical relationships, classification, causality and comparison. Classification, in its simplist form is simply listing. Discussion of causality are straightforward: errors, messages and the related problem, mechanical failures and their causes. Comparative information, though is largely limited to visual presentations in charts. Classification and causality are easiest to see and remember if the notes taken about them have a visual impact. Each of these charting techniques are given below.

Classification

The use of classification can be signaled by a colon (:), number or letters, or words such as "these include." At other times it is simply introduced by a statement as in the example above. Since outlining is the easiest way to record classification, information may be originally presented in this form. If not, students can construct their own outlines.

5:1 The APL classification provides account control of the following items:

- number of workspaces authorized
- shared variable quota
- shifts authorized
- session timing maximums and defaults

(UNI-COLL, 2-2)

5:2 Versatility a hidden strength.

Both the 732 and 733 KSR and ASR terminals are equipped with either USASCII or CAUDOTT/CITT codes and a choice of line interfaces. This makes them ideally suited for application in:

- Point-to-point communications networks.
- Computer timesharing systems.
- High-volume data entry operations, for processing of orders, credit histories and invoices.
- High-speed remote input-output ot a central computer.
- Computer systems and peripheral data communications networks for program input/output and off-line storage.

(Texas Instruments, a, 1)

There are many concerns about the impact of the computer. Most of these can be classified into four groups: 1) automation, 2) threats to privacy, 3) loss of individuality and regimentation, and 4) abuse of power. (Vazsonyi, 1977, 12)

Concerns about computers

1. automation
2. threats of privacy
3. loss of individuality and regimentation
4. abuse of political power

In addition to the financial and statistical data required by governmental agencies, business enterprises must furnish annual reports to stockholders, and various data to customers, creditors, and the general public. Some external data needs have their counterparts within the organization. Payroll records, for example, provide necessary internal data and also form the basis for financial and personnel reports to the government and to unions.

Internal needs fall broadly into two classes: operations and control. First, a tremendous amount and variety of routine operating documents are necessary as evidence of (1) primary transactions with customers and vendors; and (2) subsequent activities involving production, personnel, materials, equipment, and accounting. For example, the issuance of a purchase requisition indicating a departmental need for materials may

start a chain of events requiring the completion of many additional forms and records. These might include a request for quotation, purchase order, receiving record, inspection report, inventory record, and voucher check in addition to necessary accounting entries.

The second internal need is for data to be compiled in informative reports for use in analyzing progress, determining policy, solving problems, and planning actions of the future. The much-discussed "information revolution" of recent years has created a whole new dimension in data processing, The objectives of data processing now extend far beyond the routine handling of transaction documents and records of other types. Providing management with timely information to facilitate greater control and improved decisions has become increasingly important. (Arnold, Hill, and Nichols, 1978, 3)

Internal data needs

A. Operations documents of
    1. transactions with customers and vendors
    2. production, personnel, materials, equipment, and accounting activities
        a. ex: purchase order

B. Control reports for use in
    1. analyzing progress
    2. determining policy
    3. solving problems
    4. planning future actions

Causality and Procedure

At times data processing manuals present prose discussion of causality. These usually relate mechanical or programming errors and their causes. Such information can be recorded in an easy-to-remember visual format in a two or three column chart. While it may not be practical for students to record all such information in charts, initially the recording process focuses their attention on

the causal relationship. In addition, at times it is important to have a ready reference for certain key information.

> If a character does not code properly a grounding clip lead at the character encode driver output will enable a static check for those diodes which should be conducting for the code. By grounding two or more such points the multiple detection circuitry can be checked. The reference voltage at the multi-recognition comparator should be approximately 3.5 volts. Two or more characters the voltage level should drop to approximately 2.5 volts or less causing the comparator output to become "high" which gates to the controller through the interface a multi-recognition bit ($CC2^{10}$) active. (Scandata, 2250/1 Troubleshooting, 15) (OL, #4, 12, 42)

Problem	Troubleshooting
Character codes incorrectly	grounding clip lead at character encode driver output to check circuitry. Voltage should be 3.5 (2.5 for two or more characters)

Exercise 14

Construct your own chart for this data processing problem.

> When a non-recognition occurs and all codes for recognition are present in the FCR as shown by the Conrac display it is usually indicative of a failure in the FDM section. The problem can be isolated in most cases by removing the FDM boards, one at a time initially, until recognition takes place. Care should be taken when replacing diodes or adding diodes for new design on the FDM board that they are placed in the proper direction that is, with the cathode (end with the band) always connected to the horizontal line. This is the only place in the system where this occurs. Diode masks, Feature Matrix, Character Encode, Feature Encode Matrix boards all connect the cathode to the vertical. If a multi-recognition occurs it is best to approach the problem, here again in H/T Display mode, by turning off the character that should recognize by grounding the character encode driver input. It then

becomes a matter of checking the Feature Code Register against the FDM boards. (Ibid)

Problem	Troubleshooting

Much more common in data processing is the use of flow charts which are diagrams of either causality or procedure. Since the construction of flow charts is an important part of a data processing curriculum, it will not be discussed here. Please refer once again, though, to the section on reading flow charts in Section 4 (Paragraph Comprehension and Illustrations).

Comparison

The final logical relationship to be discussed is comparison. Comparative discussions are not common in data processing texts or manuals. However, comparison charts are. Students need practice in correctly reading such charts, including instruction to pay attention to footnotes, captions, and introductions. Charts such as those below can be used as examples with the instructor asking questions such as compare the height, in centimeters, of a recognition unit and a document transport and scanner" (See Figure 17, 18).

Figure 17: Charting

TABLE 2: EQUIPMENT DIMENSIONS AND WEIGHTS FOR 2250/1 OCR SYSTEM (Model 450 Recognition Unit).

	WIDTH IN.(CM)	DEPTH IN.(CM)	HEIGHT[1] IN.(CM)	WEIGHT[2] Lb(KG)	KVA	BTU
OCR Control Unit (Model 151)	26(67)	33(81)	60(152)	425(193)	.45	1485
High Speed Paper Tape Reader/Punch Model (140)	N/A	N/A	N/A	N/A	.1	330
OCR Control Console (Model 150)	26(67)	33(81)	60(152)	500(227)	.38	1254
Recognition Unit (Model 450)	26(67)	33(81)	60(152)	300(136)	.2	660
Document Transport and Scanner (Model 350)	30(76)	86(216)	53(147)	900(450)	2.3	7590
Teletypewriter (ASR33, KSR33) Model 133-1 or 133-2	22(56)	19(48)	9(23)	35(16)	.3	1000
Peripheral Unit (may contain the following:	26(67)	33(81)	60(152)	150(68)	N/A	N/A
Magnetic Tape Unit (Model 512)	N/A	N/A	N/A	200(90)	.12	400
Magnetic Tape Formatter (Model 561)	N/A	N/A	N/A	250(113)	.16	528
Disk Drive (Model 652)	N/A	N/A	N/A	200(91)	1.1	3630
Disk Controller (Model 660)	N/A	N/A	N/A	25(11)	.03	100
Printer						
Model 820 (100 CPS)	32(81)	21.5(54)	40(100)	66(30)	.5	1650
Model 822 (200 LPM)	28(71)	23(58)	40(100)	180(81)	.8	2640
Model 824 (600 LPM)	33(84)	28(66)	45(114)	370(168)	1.4	4620
Scan-Plex I Key Station (Model 751)	21(53)	23(58)	14(35)	75(30)	.12	3960
Scan-Plex Key Station Table (Model 70005)	48(122)	26(67)	27(69)	25(11)	N/A	N/A

1 With leveling feet extended 1 in. (2.5cm)

2 Approximate net weight

Figure 18

See Table I below for conductor sizes for different lengths of wiring runs to keep the voltage drop to 2 volts or less under a load of 40 amperes at a conductor temperature of 40° C.

TABLE I MAIN WIRING CONDUCTOR SIZES AWG CU OR EQUIVALENT

One-Way Length of Run Ft. (m.)	115/230 v. Single Phase 3 Wire All Three Conductors
Up to 37 (11)	No. 8 AWG Cu
37 to 67 (11 to 20)	No. 6 AWG Cu
67 to 91 (20 to 28)	No. 4 AWG Cu
91 to 146 (28 to 45)	No. 2 AWG Cu

One-Way Length of Run Ft. (m.)	120/208 v. Three Phase 4 Wire All Four Conductors
Up to 50 (15)	No. 8 AWG Cu
50 to 78 (15 to 24)	No. 6 AWG Cu
78 to 123 (24 to 37)	No. 4 AWG Cu
123 to 197 (37 to 60)	No. 2 AWG Cu

(Ibid)

Exercise 15: Textbook Application

Select three paragraphs or sections from the text assignment for weeks nine, ten or eleven that present classification and causality or procedure discussed above and complete a note chart on them. In addition, locate on comparison chart.

Classification

1. Pg. #

2.

3.

Causality

1.

2.

3.

Comparison Chart: Topic_____Page # _____

Teaching Students to Recognize and Record Complex Information

Chart notetaking as demonstrated here can be introduced anytime after week six, whenever it is appropriate for your text. Reading comparison charts may be discussed even earlier. Classification and causality charts need not be presented at the same time. For convenience sake, it is assumed here that both will be introduced during weeks nine, ten, or eleven. Each form should be presented on a

separate day. One or two sample paragraphs or sections can be given and the students can construct the charts as a class. Related homework assignments should be given as soon as the appropriate text selection are covered.

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2. Ibid. Support research demonstrates deceptive nature of mean as measure of central tendency in occupational curricular literature readability research.

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